ERRATA.

At p. 115, Col. 2, l. 7 of order 27, *for* "longana" *read* "Longana."

„ „ 116, Col. 2, *for* the second "Bauhinia" under order 30, *substitute* double commas.

„ „ 120, Col. 2, l. 3, of order 54, *for* "petiolaret" *read* "petiolare."

„ „ 124, Under order 75, *dele* the seventh and eighth entries (*i.e.* of two plants of the genus *Phyllanthus*), and

„ „ 125, *insert* the following as the last entry under order 75—

"„ ..... „ Madraspatana— | —Kanocha."

„ „ 126, Col. 2, l. 2 of order 83, *for* "Cirnum" *read* "Crinum".

„ „ 127, Col. 2, l. 8 of order 96, *for* "terminaris" *read* "terminans."

„ „ 127, Col. 2, last line but two from bottom of page, *for* "fulcatum" *read* "falcatum."

„ „ 128, Transfer the last two entries from order 99 to order 96.

JOURNAL

OF THE

BOMBAY

Natural History Society.

No. 2.] BOMBAY, APRIL 1887. [Vol. II.

WATERS OF WESTERN INDIA.

Part III.—The Konkan and Coast.

(By a Member of the Society.)

We now come to the aquatic invertebrates, creatures not only in themselves difficult to examine and describe; but as yet not dealt with in any handy local text-book.* The following notes, therefore, will not be very scientific:—

To begin with the Mollusca, or "shell-fishes" and their allies, we find at their head the Cephalopoda; Nautili, Cuttle-fishes and Squids; the most of which have no visible shell at all; and only one has a real shell.

This is the Pearly Nautilus, the sole survivor of an enormous number of "shelled cuttle-fish" having 4 gills, numerous rather short arms, and no ink-bag.

I never got but one specimen here; a dead shell very much the worse for wear, which may have been hove overboard from some ship.

Next, for convenience, I shall take the so-called "Paper Nautilus." This was the Nautilus of the ancients; but we now distinguish it as "Argonauta."

* My friend Mr Murray is engaged upon a Monograph of our crustacea, to appear in his Periodical, which is badly wanted.

The animal has an ink-bag, eight arms and only two gills. The female only has a shell; and this, looked upon as a shell, is a fraud; being really no shell at all, but a sort of nest that she makes to hold her eggs in. It is true that she begins early; young female Argonauts themselves leave the egg with the beginning of a shell about them; much as the human female nurses a doll before she gets out of the nursery herself.

The male has no shell at all; and is a common looking little "octopus," not a quarter the size of the female.

I got one "shell" of the "Paper Nautilus" at Alibag, which had been taken in a drift net with the animal in it; but the latter had "dropped out" according to the captor. This was probably true; there is no muscular connection between the animal and shell (as there is in all true shells); and there was no more reason why the Argonaut should not leave the shell in the fisherman's hands, and do very well without (until, as she probably would, she had secreted a new one) than there is against a hen bird's leaving her nest. This shell is in our Museum.

The rest of the eight-armed cuttle-fishes, ugly creatures, live, on this coast, mostly about the reefs. Out of water they can only crawl; but when the weight of the blob-like body is taken off the arms by the water, they pass over the bottom with what can best be described as a rapid striding motion of arm after arm, or drive themselves stern foremost by spurting water out of their "funnel," at the same time closing the arms together, and letting them stream behind, so that the whole creature looks like some sort of tadpole, or big-headed vertebrate fish, and not a bit like one's idea of a "cuttle-fish."

Some of them have a sort of membranous fins (but I have not got any of these here), and all have an internal rudimentary shell, usually in two pieces, very small and rather hard to find.

The next group is that of the Decapod cuttle-fishes and squills, all of which, besides the eight arms allowed to the Octopods, have two "tentacles" considerably exceeding the arms. Of these we have several species of *Sepia* and *Loligo*.

The Sepia, or true cuttle-fish, lives chiefly near the shore, but in pretty deep water. I never saw one caught between tide-marks here. He comes, too, much more off the bottom than the Octopus; and can swim head foremost upon occasion, by means of fins extending along the whole of each side, though he prefers travel-

ling backwards. These fins, and the muscles that move them, derive some support from the so-called cuttle-bone, which is really an internal shell consisting of a leaf-shaped spongy mass with a very hard sharp curved point at the rear end.

The cuttle-bone, though you can crush it between your finger and thumb, has considerable durability. It survives all the rest of the cuttle-fish, except his beak, in the stomachs of large fish and Cetaceans; and must often pass through these, or, in case of cuttles dying a natural death, remain after the flesh has been eaten by small marine scavengers of one sort or another. At any rate, it is a common object of the sea-shore here; and is used in native medicine as an astringent, with what effect I don't know. In old European practice it was a known antacid, whence the name of the commonest European species, *Sepia officinalis*; and also, in a powdered state, was "pounce," which was used to dry writing before blotting paper came into fashion, and to some extent, I believe, in metallurgy.

The next division of Decapods is that of Calamaries or Squids (*Loligo*), distinguished from the cuttles by containing a rudimentary shell (sometimes two or three of them) in the form of a thin horny transparent blade, commonly known as a "sea-pen."

The fins are rather caudal than lateral; and the squids make better head-way than any of their kin; though they, too, seem to prefer travelling backwards as a rule. They are much the most active of the order, some of them can jump out of the water, and are known to sailors as sea-arrows (the tail fins present something the figure of an arrow-head).

All the Calamaries prefer deep water, and the surface of it, though they are by no means helpless at the bottom. They are common on this coast.

Indeed, there is hardly any sea where you will not find octopods, cuttles, and squids, eating, and being eaten by, most other marine creatures; including the marine variety of *Homo Sapiens*. We have here none of the class capable of catching a man alive; the largest cuttle bones I have got were not 13 inches long, and I never found any squid of these parts exceed 3½ feet (including the tentacles), nor are any monsters of the class reported by the native fishermen here.

But the *Enoploteuthis* of the South seas is said to reach 6 feet long of head and body alone, and *Architeuthis* of the North Atlantic is "certainly known to attain a length of 15 feet or upwards to the

body and head; and from 30 to 40 feet or more in the long tentacles." That is to say, this amiable creature is as big as a small boat, and has a spread of yard-arm that would do credit to a good-sized ship.

It was lucky for Victor Hugo's hero "Gilliatt" that he only fell in with a "*pieuvre*," and not with an architeuthis, the more so as most of these large squids are pretty well provided with sharp hooked claws.

Some fossil Cephalopods were as long as a man (or more) in the body, but these were probably Tetrabranchiate; and (so far as we have any means of guessing) inferior in activity and in length of arm.

On the other side of the question, men certainly eat most sorts of squids, cuttles, and octopods; and I can myself vouch for some of them being fairly good eating. The ink should be got rid of before cooking. I remember once getting, in Italy, a dish of small octopods, which would have been very good, if at every stroke of the fork the ink had not spurted out, till the whole mess looked as if the sauce had been made of blacking.

Pretty nearly every sea fish eats every cephalopod he can catch; and gulls sometimes capture squids on the surface. The Marathas call cuttles "Mákuli," squids "Sit-Makuli," and octopods "Au-Mákuli."

The Konkan coast, with its basaltic reefs and muddy water, is not so rich in shells as might be expected of a tropic shore, and the best that I can do here is simply to indicate those that I have observed, following Woodward's classification as closely as possible.

Every beach seems to vary; and there are many Konkan shells in our Museum that I have not collected here; but, writing in the jungles, I cannot refer to the catalogue.* We have few native Strombidæ, the chief is *Rostellaria curta*.

My next shell is a *Murex*, closely resembling the English *M. erinaceus;* and called by children "Aswália" or "Bear-shell." These children's names are rather useful, as grown up natives hereabouts have but few names for shells. A big univalve is Kubá, and a little one Kubi; and bivalves in general are "Shipi," or some

* For instance, the pretty blushing *Hemristoma* seems to be abundant just north of Bombay; and is often brought into the city in road material, but I have never got it in, or south of the harbour.

derivative thereof. I have also got other *Murices*, and a *Fusus* (probably *F. colus*), *a Pyrula*, and others unidentified.

Of Buccinidæ we have a good many handsome sorts *Eburnea* (*spirata* ?), a *Terebra*, species at least, and I think a *Nassa*. Our finest shell is a *Dolium*, as big as a boy's fist, which makes a pretty ornament when the dull brown epidermis has been scrubbed off; a thing that often happens, to some extent, during the creature's life-time.

We have, I think, two purples, and I get a great number of dead shells of Olives; but have never secured a live specimen. They are amongst the prettiest shells we have. Cones are numerous, some of them over two inches long, partly or wholly covered when alive with a bristly epidermis concealing the markings. The little boys call them "Kuttrya" (= dog-shells.)

I have once or twice received Mitres, dead shells, and constantly receive living cowries of three species, the reticulated *Cypræa Arabica*, a larger species spotted "like a pard," and a small species seldom exceeding an inch in length. This shows a great variety of very beautiful spots, speckles, and marblings and colours varying from marble yellow to very deep brown. The specimens, however, when placed side by side show such a gradation that I think they are all of one species. The young are very unlike their elders, little wheat shaped shells, with a long foraminated, turned-up spike at each end.

The money cowry occurs locally on this coast as a dead shell in considerable numbers; and wherever this happens, you will generally be able to trace it to the wreck of a dhow from Zanzibar. I know two such cowry mines myself.*

I have only got *Natica* and *Lamellaria* as dead shells. A *Potamides* is common in the mangrove swamps; but perfect specimens are rare; they seem to get broken at both ends during life. A handsome pied *Nerita* takes the place upon our reefs that the periwinkle does at home, and is, like it, a favourite food of the poor.

* The little boys call cowries "Dukari" (=pigshell). It is curious that a small shell of the same family is called "piggy" or "pigshell" in the British Isles. Colonel Yule (I think) says that Porcellana" (with the same meaning) is the name of an allied Mediterranean form amongst Sicilian children; and that probably this gave the languages of Europe their name for *porcelain*, the texture of that material, when first imported, being fairly enough compared to that of the shell. (Porcelain was little or not at all known to the earlier Greeks and Romans.)

I may add, that probably a similar name was applied in France to *some* shell or other, and may be still. It is certain that the earlier French Canadian discoverers called shell wampum "porcelaine."

Along with it are some very pretty little *Navicellæ* of different shades of blue, with white spots.

Among the *Turbinidæ* (top-shells), two species yield "appayas," that is, solid opercula fit for cheap jewellery (studs and so forth). The first is an *Imperator*, much resembling *I. imperialis*, a little grey pyramidal shell warted upon every whorl, and nacreous (mother-o'-pearly) throughout, except the grey outer skin (epidermis).

The operculum, or valve, which closes the mouth of the shell, is also "mother-o'-pearly," and looks, in fact, like a little pearl, purple or violet-edged, and in shape like one-half of a tiny split bean. The largest of these opercula does not exceed $\frac{1}{4}$ of an inch in length.

The second species is, I think, a *Monodonta*, closely allied to *M. labio*. It is a good-sized shell, nearly as large, in the finest specimens, as a billiard-ball, covered outside with an olive green epidermis, handsomely mottled with a darker green and with a deep crimson. The whole structure of the shell is nacreous; but the operculum is porcellanous (which is rather curious, but is the case with some other *Turbinidæ*). It (the operculum) is about $\frac{5}{8}$ of an inch across in the largest specimens; and much of the shape of half a split pea. The colouring is green or Spanish brown, or both; with shades of white, pink, or pale orange.

This species has long been used in India for buttons, bracelets, and the like, though not very commonly; but I believe that I myself was the first to use the operculum of an *Imperator* for such purposes.

Some species of *Turbo* from the Pacific and South Seas are much more beautiful than ours; and at one time were a good deal worked up in Paris.

In the same family come the handsome pyramidal *Trochi*, generally marked crimson and grey. All the *Turbinidæ* can be stripped of the epidermis by steeping them in dilute acetic acid (or common vinegar), and then show as entirely of mother-o'-pearl.

In the next family (*Haliotidæ*) we find the *Ormer* or Venus's ear, the largest, perhaps, and most beautiful of British shells. One or two small dead shells of a similar species have been brought to me here; but I could not find out where they had been got.

We have here, however, a remarkable member of this family, *viz.* an Ianthina, or Oceanic snail, or "Violet shell." The connection of this creature with the *Ormers* is perhaps a little overstrained. They are rock-creepers. Ianthina, on the contrary, is at home on the surface of deep "blue water"; where it congregates in great

fleets, each snail floating in his own inverted shell. I have some doubts as to whether they can sink at all. It is certain that they cannot do so when breeding, as they have then in tow a sort of raft that they make of glutinous air-bubbles, with their eggs hanging underneath it; and there is no means of withdrawing the air from this float. Moreover, the spire of the shell, which would be the upper part if the snail could crawl on the land or on the bottom, is always of a very pale blue, almost white, and the base (or what ought to be the base) is of a deep blue, which coloration, in a marine animal, is good ground for supposing that the light side is the bottom, and the dark side the top, in its regular trim.

When stranded, the Ianthina is perfectly helpless, cannot crawl an inch, and seems to die almost at once. I never could get a stranded one to live. As for catching them alive, to do that one must find out their fine weather quarters, which are probably, as far as we are concerned, on the other side of a good stretch of herring-pond; for the winds that bring us Ianthina fleets are north-westers, occurring from August to September; and the snails must be brought by them from the Arabian Sea. But to be in that sea, N.-W. of Bombay, at that time, they must have got up on the S.-W. gales of May, June, and July from somewhere far to the S.-W., probably the neighbourhood of the Seychelles and north of that. If their head-quarters were much further east we should get them with the early south-westers. I shall have more to say about these winds and currents later on.

We have one *pink* specimen of Ianthina, probably unique, and as probably coloured by disease. I picked it up myself, dead and empty; but its colour cannot well have been the result of weathering. It was perfect, and long before so fragile a shell as Ianthina could bleach upon the "thundering shore" where it was found the waves alone would have smashed it to pieces, to say nothing of frequent traffic. I find it difficult to secure a perfect specimen, except by having a watch kept on the shore (for this and other matters). When it is reported that "blue flower-shells" are coming in, I go or send at the moment of high water to pick them up. Being very light, they are always stranded along the high water mark only; and in an hour after the first of ebb the delicate tissues of the animal are withered; while a little blue stain on the sand often marks the discharge, in the last agony, of a blue fluid, which may perhaps be used for concealment, like the sepia of the

cuttle-fishes, by this otherwise defenceless creature. When the surf of the next tide (if a higher one) has passed over the dead shells, it seldom leaves one perfect. Those cast ashore at the top of springs may *be* long enough to bleach; but they always bleach blue-white, the colour of their own paler portions. If, however, there were a pink *species* of *Ianthina*, it would probably have been discovered before this. At any rate, it is a rare and lovely little shell.

The animal of *Ianthina* is remarkably pig-headed. I do not mean to impugn his morals or intelligence; but merely his profile. He is said to live upon some gelatinous things called velellæ and other acalephæ, whereof I shall have more to say further on; and certain it is that although I often find *them* without *him*, I never find *him* without *them*.

Our common limpets resemble those of Europe. I have not here got any of the queer "key-hole limpets," "Bonnet limpets" and cup and saucer shells, *Fissurellidæ* and *Calyptræidæ*; but no doubt they could be found by a collector with more leisure and knowledge, nor have I any of the extraordinary multivalve *Chitons*.

A very small *Dentalium*, or Elephant's tusk shell, is found on the sands in large numbers.

One of the beauties of our shores is a little sea-snail, *Rotella vestiaria*, which (or rather whose shell, as I never got a live one) occurs in countless numbers; sometimes colouring the beach in bands two or three feet wide and many yards long. How many species of *Rotella* there may be I know not; but we have three marked types of colour, *viz.*, an uniform dark crimson, an equally uniform coral pink, and a mottled pattern in which the ground colour runs from crimson to white; and the markings are of various shades of brown. The largest I get are a little bigger than common "pearl" shirt-studs, but some in our museum are double as big.

The land and fresh water univalves are not particularly interesting, and differ little from those of the Deccan; except the *Cremnoconchi* previously noticed; and a prettily-shaped *Auricula* inhabiting salt marshes and the like places, whence it is often washed out to sea and cast on the shore, where it passes for a sea-shell.

The *Dorids*, or sea-slugs, are pretty numerous; and one or two species reach at least three inches long. These large ones seem

to haunt pretty deep water, as I get them mostly from fishing-nets worked some way from shore. One reef-species about two inches long is of a deep crimson; another of the same size pale orange; and one which seldom exceeds an inch in length is cream-coloured, with crimson and black markings. As a general rule, however, their colours are rather dull greens and browns.

Of Brachiopods I have got none, except dead single valves of what I suppose to be a *Lingula*; but in true, or Lamellibranch Bivalves, we are well off. The oysters naturally take precedence.

Between the common eatable oyster of these parts and that of the North Atlantic I find two principal differences—(*a*) that the former is a deal less expensive, and (*b*) that, as the University has not yet taken his education in hand, he cares no more for the letter R than Mr. Jorrocks did for "a haitch." He has, however, a calendar of his own, based upon the Hindu Almanack, and usually from the Mirgsál to the Diwali, that is, from about June to October, both inclusive, you will do well to abstain from oysters in these parts, as the fishermen do.

This, however, is not a law of the Medes and Persians. When the monsoon was late, I have been assured by the fishermen that I might safely eat oysters until there was plenty of fresh water in the sea; and have done so, both I and my house, without any ill effects, until well on in June.

It is however necessary to take great care how the oysters are kept. They should be in clean sea water, and this should either be changed at least twice a day, or still better, changed every moment by the natural method, *i.e.*, by sinking the basket or other parcel of oysters in a tideway. They should always be kept "this side up, with care." *This* side is the flat, or slightly concave, external side, *which never shows any* white *scar*, as the oyster always rests on, and moors by, the other or left valve, convex externally and concave internally, so that it can retain a little water. This is of the highest importance to the oyster, especially if left out of water by the ebb, or removed from it by violence; and an oyster turned wrong side up in a basket or barrel is just as likely to live as a man hung by the heels. This is the secret of oyster packing. But in any case, tropical climates are ill-suited for the transport of marine bivalves, and a good deal of care is necessary whenever that is undertaken, and at the end of it there is always a great deal of risk to the oyster and some to the man who eats him.

On the Coast, *per contra*, the danger of oyster-eating almost always arises from gross carelessness on the part of some one or other. Nobody gets poisoned with oysters at the Clubs, or at the Apollo Bunder, where proper care is taken in the matter. In one case that came under my notice, I myself, and my household, ate safely of a basket of oysters for three days, at almost every meal; and a man who had eaten them there was afterwards "poisoned" with oysters out of that very same basketful, only in the meanwhile they had passed out of my hands.

As for "copper in oysters," supposed to be derived from rocks, it is a fact that the juices of oysters do, at least occasionally, contain a trace of copper, but a dose of copper likely to affect a man would probably be enough to kill a whole keg full of oysters, certainly far more than enough for any number of oysters that the man could hold. If any gentleman doubts this, let him mix a dose of verdigris with the water of an aquarium, and see how long any oyster or any thing else, lives in the poisoned water.

The fact is that nothing is so hateful to shell-fish, and especially to the *Conchifera*, as the exide of copper; and that is the reason why it is useful on a ship's bottom. Sir Humphry Davy prevented the copper on a ship's bottom from rusting (by a galvanic experiment which need not be described here), and the result was that that ship's bottom immediately became foul; the *Conchifera* and *Barnacles* having no further reason to fear it.

We have several other oysters here; one has the lower valve plaited, making it look something like a bird's foot. This is little eaten. Another small and rare species of the creeks has the valves long, narrow, and rounded like dinner-knife blades, seldom exceeding 1½ inch in length. I have not got here the "Mangrove oyster" (*Dendrostrea*) which "grows on trees." All oysters, or nearly all, will grow upon dead wood. The connection of "oyster poisoning" with Mangroves is a mare's nest.

Of the so-called Pearl-oysters, *Placuna Placenta*, the Window-oyster, is common here; and is still sought after as containing seed-pearls. It seldom produces large pearls; and since it ceased to be used as a substitute for window-glass, its value has fallen off. I once got here a single small fresh valve of the true Pearl-oyster (*Avicula margaritifera*). It must be very rare.

Our Scallops are small and unimportant; and we have, I think, only one small Spondyle, conspicuous by its orange colour; but

I may have classified it wrongly. I have only got loose dead valves of this shell. We have several Arks, usually found as dead shells on the sands, and prettily marked.

We have one very fine sea-mussel, *Mytilus smaragdina*, the Emerald-mussel, which earns its name by the green internal border of its valves. There are larger mussels here and there, but taking the average, it is a handsome species. It is here a shell of the reefs, less gregarious than the European *Mytilus edulis*, and not common enough to be, like it, an important article of human food or bait. We have one specimen in our Museum with a rough pearl in it. This came to me alive from the Alibag reefs.

The true *Modiolæ* are less common, and our basalt rocks are generally too hard for *Lithodomus*; but I have found the latter in large old dead oyster shells.

We have at least two of the *Unionidæ* or fresh-water pearl-mussels, the same, apparently, as in the Deccan. One is rather thin in the shell, and of a pale olive-green externally (*i.e.*, in the epidermis); the other is larger, thick and strong, with a black epidermis, very like the British fresh-water pearl-mussel. I have got no pearls in either here. They are pretty common; and the thin-shelled species, at least, is eaten.

Of the strange and monstrous *Tridacnas*, Woodward gives one of the queerest forms, *Tridacna squamosa*, as from Bombay, on the authority of Chemnitz. I never got it here, nor can my fishermen recognize the figure. (They are usually pretty sharp at that.) A good many animals can be collected in Bombay that were born a long way off, as *we* know, if any body does.

The great *Tridacna* is commonly imported into Bombay from the China seas, as an ornament for gardens, and is said to be used as a font in some Catholic churches. I don't happen to be a Catholic, and do happen to object to making sights of Churches, so I don't know whether this is true or not. The shell is quite big enough to immerse a whole baby, but it belongs to the coral seas.

Cockles we have, a few; but they seem to want the flavour of the North, and are most used in making lime to eat with betelnut.

I have not identified any *Cyprinidæ*, but a better conchologist probably could. We certainly have one at least of the *Veneridæ*, a shell very like *Cytherea Dione*, only locally common. One of this order is rather famous, the *Venus mercenaria* of the Atlantic States, also known as a "clam," and by the Red Indian name of "Qua-

haug," (pronounced quaw-hog). The best "Wampum," was made of this shell, whence the scientific name, and it is still useful, not as coinage, but as forage.

It may here be observed that the commercial and gastronomic term "clam" does not now admit of scientific classification. *Venus mercenaria*, as just mentioned, is a "clam," and *Mya Arenaria* (quite as different from it as a black buck from a bison) is a "sand-clam," and so forth.

As for "clam-chowder," it is very nice; but I fancy the clam has nearly as much to say to it as the limestone had to the limestone soup in Lever's story.

A "clambake," is a "stupendous and terrible spree," in which you bake everything you can think of along with the clams, eat the other things, drink everything you can think of, and leave the clams to be eaten by any one who has no better to do, bar one or two, just to satisfy your soul. There is nothing on earth so hypocritical as a "clambake," but it is a fine spree for all that, or because of it, the hypocrisy is so very transparent that it does'nt hurt any one's conscience much, and the clambakers go away laughing at each other like Cicero's augurs. I wish some one would introduce clambakes into Bombay.

I am not sure that we have any *Mactras*, though the accommodation is good for *M. Stultorum*.

Of *Tellinidæ*, I think I have got broken valves of *T. planissima* and *diphos;* dead, of course. We have a Razor-fish *(Solen)*, which I cannot distinguish from the British *Solen Siliqua*, except by its inferior size. It is, like the British species, to be got in the sand at low-water of spring tides, and it may be worth saying that the Razor-fishes are equal, as eating, to scallops. Like scallops, they should be cooked. Boiled Razor-fish is good enough, but "*au gratin*," or "à la Hollandaise," is better; looks like Maccaroni, and is much more to the purpose.

Cultellus politus of the same family is a very pretty shell; common (as a dead shell) on our shores.

Passing over some families not well represented here, we come to the *Pholadidæ*, or boring molluscs, who compel our attention, like dynamiters, by threatening our lives and public buildings, such at least as they can get at, namely, ships and piers, and the like.

The type of the family is the English *Pholas dactylus* or Piddock; and one species of these seas, *Pholas bakeri*, requires a better

Naturalist than I am to distinguish him from the same. The shell is long, oval at one end, and at the other tapering off into a sort of duck-bill shape. The heavy end is covered with toothed ridges, and although, at a glance, the whole shell appears to be one of the most delicate and fragile of the Coast (*the thin parts are translucent*), an attempt to scratch it with a penknife shows that it is of very hard stuff.

To borrow for an instant the special slang of the Mineralogists, most sea-shells are of something like Calcite, but the Piddock and his breed house themselves in Arragonite, a very much harder form of lime. Such a statement, of course, requires to be taken with a good deal of allowance for a "allotropism"; and other Mineralogical and Chemical details that would be out of place here; but in the main it is as true as that horses are shod with wrought iron and "jumpers" with steel. "Jumpers," be it known to any reader that didn't know it before, are tools like crowbars, used for boring holes in stones; and of the same use is the shell of the Pholads.

The "Piddock" himself, though the chief of the family, is not its most active member; piercing chiefly clay and chalk or such comparatively soft substances. He looks, too, like a shell-fish, has the regular two valves of the Conchifera, (there are really five plates, but three are inconspicuous) and nothing very striking about him at first sight, except that fully half of him, the foot, is as transparent as ice. He works like an awkward boy beginning to use boring tools; by half turns right and left; blowing out his sawdust at intervals; if one may use such a word where the respiratory medium is water.

As we proceed with this family, we find, in some, the bivalve shell little more than rudimentary, not covering more than one-twentieth part of the animal. This is the case with the Teredos or ship-worms; so-called because at first sight they look a good deal more like worms than "shell-fish." In others the shell has four or five valves, easily distinguished, and covering the whole, or most, of the animal.

Speaking generally, the long "ship-worms," work *with the grain* of the wood that they attack. They line their tunnels with concrete, and have a sort of miner's law amongst themselves, in virtue whereof they never invade each other's "claims." They usually bore in wood, sometimes in mud. The mud-boring species have been lately sufficiently dealt with by another member of this society, under the name of Kuphus.

The short, completely shell-clad species, *Xylophaga*, *Martesia*, &c., attack wood, oyster-shells, and stone. They do not line their tunnels, and they have no regulation as to boundaries, boring with or across the grain, cutting each other's lines, and sometimes, to judge by some specimens that I have seen, cutting through each other's shells. It is probable, however, that the shells so cut through were empty.

Both groups are numerously represented here. Native vessels suffer little from them, partly because they are usually teak-built, and well protected with the peculiar compound called "chopan," but still more because they are very frequently beached and any long exposure to the air is unpleasant, not to say fatal, to the Pholads. European vessels are usually either coppered or iron-built, and the ship-worms are therefore not now a terror of the sea. But both the long "worms" and short shell clad borers still play havoc with piles and the like on this Coast.

It is not very long since we had a honey-combed block of wood in our rooms sent in by the Department of Public Works, with an accusation against certain sea-anemones inhabiting the holes. These, however, had certainly been made by at least two Pholads; one a Teredo "stealing by line and level" as already described; the other probably a Martesia; burrowing at his own sweet will, and "jumping the claims" of his brethren and predecessors without remorse or ruth.

Both had abandoned the pile before it came into our hands (having probably eaten all the soft wood in it) and the burrows had been colonized by sea-anemones and crabs.

The most remarkable exploit of the Bombay Pholads was the piercing of wrought-iron pipes at Hog Island, for positive evidence of which I am indebted to the courtesy of another member of this Society. The pipes, containing water at a very high pressure, were served and parcelled with yarn and so forth to protect them from the water, and this covering, probably, first attracted the Pholad, one of the short fully-shelled species, probably a Martesia.

When he had got through the covering he went on with the pipe. The holes were like clean countersunk holes, and were most likely drilled, by a movement similar to that already described as used by the "piddock," but their clean appearance, and the exposure of the grain of the iron, give reason for suspecting that the mollusc *had the aid of an acid*; which, in that case, he must have secreted himself.

Of course, the moment that any hole reduced the thickness of the pipe so far that it could not longer bear the tremendous pressure of the water within, the remaining diaphragm of metal was burst out, and the miner driven out of his own burrow like a shot from a gun, so that, although we have the "*corpus delicti*" plain enough, the *corpus delinquentis* is not likely ever to come to hand (in the case of a finished hole). But an oyster shell in the Society's Museum shows a small Pholad dried in his burrow, who is probably near of kin to the miner of Hog Island. The story is perhaps one of the most remarkable in the modern history of Molluscs; and with it I close my remarks on those of the Konkan.

Having, so far as in me lies, treated of the true Molluscs, I have to deal with the other Invertebrates, under especial difficulties. Very few men, not being professional naturalists, really understand the multitudinous and multiform *canaille* of the waters; and as for books, I am now in a remote jungle, dependent on *one* Nicholson's "Manual of Zoology." I write, therefore, very much subject to correction, and shall have done all I can hope to do, if I happen to help any one who knows less than myself. So far as possible, I shall follow the classification of the standard work noted above; and shall draw on it for some of my facts; as, in respect of the Mollusca, I have depended mostly on Woodward.

Of the higher tunicaries, the Ascidians seem to be rare here; at least I have got very few, and those not remarkable. These are the creatures about whom it passed for a joke, some years ago, to say that "the Darwinians believed themselves to be descended from a marine Ascidian."

The truth of the story is, that a Mr. Kowalefski considered himself to have discovered, in the larvæ of certain Ascidians, structures analogous to those characteristic of vertebrate animals. In this he was supported by other naturalists, and, amongst them, by the late Mr. Darwin, who, moreover, stated that he had, long before Kowalefski's publications, made similar observations on certain Ascidians at the Falkland Islands (where, it may well be supposed, he had not the best laboratory in the world).

The whole matter, as regards the Ascidians, comes fairly within the scope of this paper; but it need hardly be said that I do not propose here to take up such a subject as the doctrine of Evolution. It may fairly be said that many competent naturalists consider the supposed vertebrate affinities of the Ascidian larvæ to be merely su-

perficial; that the adult Ascidians show no trace whatever of such affinity; and that as things now stand, an amateur naturalist may most safely assume the Amphioxus or Lancelet fish of the Mediterranean to be the lowest known vertebrate. I think it possible that the little transparent fish, mentioned at the end of my last paper, will be found to represent the Lancelet here. But I am sure that it will supply no missing link, having bright and distinct eyes, whereas those of Amphioxus are rudimentary, or little better.

I have received and sent in to our Museum a few creatures that I took for Salpœ.

Of the *Polyzoa*, I have sent in several specimens of at least two forms of *Flustra* (Sea-mats, or Sand-corals): these abound on the coast; they are very beautiful, and abominably brittle. Their growth is extremely rapid under favourable circumstances. We have in our Museum one very large specimen. It is (I write under correction, as the thing is very brittle; and goes on diminishing every time it is moved) over 18 inches long, 15 wide, and 8 deep.

This grew on an iron buoy that I scraped and painted (partly with my own hand) and sent to sea at the end of September 1885. The buoy was landed in May 1886, and the men who did that job preserved for me the *Flustra*, which was therefore of under 8 months' growth.

Of the aquatic insects little can be said here. The entomologists justly claim a monopoly of their extremely intricate subject; and any one else touches it at his peril. I have already noted that certain water beetles are food for crocodiles, and every one knows the great water beetles that fly against the lamps of the Byculla Club, and look "as big as sparrows." As I write, a small bright green species lies in heaps, like pebbles, on the banks of a tank before the tents; and for some reason is untouched by the numerous crows and other birds feeding about. Certain beautiful tiger beetles haunt the sands, and a species (apparently) of beetle skims the surface of the sea in calms, like the "water boatmen" (*hotonecta*) of English fresh-waters (which, however is not a beetle). During the height of the South-west monsoon, the life-boats cruising off the coast see coloured butterflies at sea. But whether they come from Africa, or Madagascar, or the Mauritius, no man knows. This much is certain, that they appear very much at home

in a whole gale, not at all so helpless as one might imagine; and I know from other observations that in light winds a butterfly can weather on any ordinary sailing-boat, and will do so, going to seaward. What his motivo may be I don't pretend to explain. One can hardly credit a butterfly with the ideas of a Columbus.

In Crustacea our waters are rich enough. We have no true lobster (*Homarus*), but the lobster's place and name are taken on our tables by several marine cray fishes. There is a certain confusion about the popular names of the long-tailed crustaceans which I shall try to clear up, so far as may be. A lobster is a long-tailed marine crustacean having claws big enough to be worth eating, a hard, black, calcareous shell, and a long serrated horn on his forehead. A *river* cray-fish (*Astacus*) is a sort of dwarf lobster. His English name is derived from the French (*Ecrevisse*), and he has stood godfather to a lot of *sea* "cray-fishes," which differ in having no claws big enough for the table. Among theso are the French Langoustes (which in France are considered better than lobsters, the opposite doctrine obtaining in England) and tho "lobbishta" of our butlers. In these the horn, as well as the claws, is absent, or much smaller than in Homaries, and is also apt to be squarer in section.

A prawn is a dwarf lobster, with the regular horn, and sometimes with the broad heavy claw. One of our common species here is a perfect miniature lobster in shape. But the prawn's shell is entirely or mostly horny; and more or less translucent. A shrimp, again, has no horn or claws to speak of. The whole group, however, are very closely connected with each other, and are known to science as "Macrurous Decapod Crustacea," that is, "long-tailed, ten-legged, shelly creatures." The prawns in particular are extremely numerous here, and many of them are very richly coloured, though unluckily tho colours do not last in spirit. Most of them, after death (no matter how caused) turn red, or reddish-white. One small marine species appears to be born boiled. We have several fresh water species. A very small one haunts mountain springs with the Alpine carps and loaches. A very fine one is found in all our rivers, and is a source of great annoyance to the angler, unless he is hooked, which is very difficult to manage. However, as the capture of the prawn requires far more skill or luck than that of any vertebrate fish in our waters, and as he is very much superior to these for the table, an angler sometimes gets a good deal of comfort out of him. The prawn swims low, never more than three feet

above the bottom, and usually on it. His presence is easily discovered, as he pulls the float to and fro, or round in circles, and finally walks away with it, with a motion easily distinguished from that of any fish. You can get rid of his attentions by shortening up the trace under the float; but if you want to catch him you must use the smallest and toughest bait, such as a bit of sinew, and leave the point of the hook well bare. Such a bait he will probably take into his mouth, after fumbling about it a good deal with his claws, and then a smart stroke will drive a sharp hook through his shell. He will fight for about a minute, and sometimes cuts the line with his claws. A good prawn will measure 9 inches from the tip of the horn to the tip of the tail, whereof 6 inches are good eating, and amount to one good help of lobster. The length of the great claw-bearing legs is the same as that of the animal. The other pairs are short and feeble. The claw-points cross each other when closed, and inflict a nasty little wound. They, and indeed the whole claw-bearing (cheliferous) limbs are somewhat calcareous or crusty and opaque, showing an approach to the lobsters and cray-fishes, but the rest of the shell is horny and translucent.

The *Anomura* (or eccentric-tailed crustaceaus) form a group between the long-tailed lobster tribe and the crabs. The commonest of them here are the Hermit crabs, all closely resembling the European *Pagurus Bernhardus*. The anomaly of their tails is that they are naked; and in fact the whole animal of Pagurus may be likened to a prawn half-shelled. What shell he has, however, is stony and not horny. By way of shelter, the Hermit-crab takes up his quarters in any empty univalve shell that he finds handy, coiling away his naked tail in its spiral chamber, and making fast with a sort of sucker that he has *ad hoc*, so well that you may pull him to pieces easier than make him let go.

The Hermit-crabs are exceedingly numerous here. Their small fry, in thousands, inhabit dead shells of Rotella; and the larger those of whelks and murices, &c. A very favourite shell with them is that of *Potamides*. They give rise to some disputes between me and my collectors, who are led to expect higher prices for shells containing the living animal, and always pretend not to know that the Hermit-crab is other than the proper inhabitant of the shell. Another group of the Anomura are the so-called "crab-lobsters," (*Porcellanæ*) which are not very common here.

The true Crabs are classed as Brachyura (or short-tailed), and

invariably carry their tail tucked between their legs; nor is it of any great use to them, except that the females carry their eggs between it and the body. They are extremely numerous and various in our seas and fresh waters. Racing crabs (ocypoda) are not common in extra-tropical countries. The Irish, indeed, have a proverb, "Ye may be a racer, but ye don't look like it; as the Devil said to the crab," which indicates a want of acquaintance with this group. For the ocypods not only *are* racers, but *do* look like it. Another family, the *Gelasimi*, "calling," or "laughing crabs," may be described as large claws with small crabs growing at one end of them. They are numerous wherever a mixture of sand or gravel with mud exists between tide-marks; and in such places you will often see from afar the bank covered with as it were white pebbles, which suddenly disappear as you approach. These are the claws, which are mostly white, with more or less red, black, or blue; and they have retired into their burrows.

Some small burrowing crabs cover many miles of the sands with the "spoil" (engineers call it) from their burrows, made up into neat little pellets, and removed from the holes in a fashion that looks like bead-work, arranged in a pretty vine-leaf pattern. Others only make a rough spoil heap near the burrow, and the work of both is easily mistaken for that of worms.

Then there are spider-crabs, and "peacock-crabs" (*mhor pakhi*), so called from their coloration, with three ocelli like those on a peacock's tail. There are many native names for them, "*kenkad*" is a general one "*Dhaw-more*" (running-crabs) are the *ocypoda* and *gœlasimi*; "*Sawa-more*" are queer grey crabs with feathery legs found in the creeks, but not common. "*Chimbore*" are another estuarine species, and "*Mute*" are land-crabs. The giant of the Crustaceans, *Birgus latro*, the cocoanut-crab, is not found here; and indeed I must confess that all our crabs are wanting in size as compared with those of northern seas. I have some Europe crab-shells in which I get the Indian crab baked; and have arrived at an equation as regards our largest eatable species here, viz., that they are to the British crab exactly as a tailor to a man. They have their seasons, and are not always wholesome; but the natives can generally be trusted to report upon that.*

* NOTE.—The Land Crabs (Gecarcini) are said to be unwholesome in the hot weather, and other species at the change of the shell. I do not know whether the famous soft-shelled crab of the United States is a separate permanently soft species or not. It is certainly by no means poisonous.

Another group of crustaceans is parasitic upon fish, and very often kills them. The salt-water catfishes are the commonest victims. If they had enough sense to deliver each other, as the monkeys do, they could very easily turn the tables on their tormentors; which are ugly flat white creatures, sometimes as big as a sixpence, or bigger.

The most curious, perhaps, of our crustaceans are the hideous "Mantis-shrimps" (Squilla), which get their name from their peculiar claws, deeply-toothed, but not fitted with nippers, somewhat resembling those of the Mantis insect (the Indian Daddy-long-legs, that *does* say his prayers, chiefly grace before meat). Our largest species (*S. oratorio*) grows to more than a foot long, and appears to be very sluggish. Some that I kept lay all day half concealed amongst stones and weeds, but with the claws free and ready for action; and this may, perhaps, be their method of capturing live prey. It is likely however that, like most crustacea, they live a good deal on carrion. Several smaller species are very active. In one of these the armed claws are absent, and the principal legs end in what look like rudimentary nippers, indicating an approach to the lobster's claws.

I have not got any King-crabs here, but they may very well be here. They are queer-looking round creatures, with thin legs completely concealed beneath them, and a long sharp spine in their tail; and are not, indeed, really crabs at all, but more akin to the fossil trilobites; some naturalists say to the Scorpions.

The last of the crustacea are the barnacles and acorn-shells (*balani*) which no one, to look at them, would take to be crustaceans at all. Almost every one has seen the common ship's barnacle, a little delicate shell, with several valves, attached by a long worm-like stalk to ship's bottoms, or any other floating matter; and nearly every one knows the old story of how these barnacles developed into geese. They are very common here; one species is of a bright orange colour, but loses its complexion in spirit. They don't usually attach themselves to stone, with one curious exception, *viz.*, Pumice stone. And in the matter of wood they prefer what is afloat to piling or other fixed timber.

The Sessile cirripedes (commonly called Acorn-shells), on the other hand, prefer stone and fixed timbers, but are not exclusive. They are sometimes wrongly called limpets, but are easily enough distinguished; little conical hard shells, with a hole in the top,

looking like a tiny model of a volcano with its crater. On close examination the cone is seen to consist of several plates, and if the creature be alive there will be seen a second cone inside the crater, which is the "operculum" or door valve. A small white species is very common on rocks between tide marks, and some of the outer reefs have a very fine species, with an extremely massive shell, which grows in great clusters as big as a man's two fists. Individual shells are often an inch and more long; the colour is a dull red or black, which weathers, after death, to pink and white. In this condition the shell looks something like a large flower bud turned to stone; and is very effective in the rockwork of a fernery, or the like. It is occasionally called a "tulip-shell," an appropriate name enough.

We get another species on turtles, which is not calcareous but horny, and looks very much like an old-fashioned great-coat button; the colour is a dirty white. Specimens from the under-side of the turtle seem to some extent lighter in colour, perhaps because they are less exposed to light. We have some such specimens in our Museum. They don't do the turtle any harm; living on what they get from the water. Some barnacles are said to attach themselves to Whales and Porpoises, but this I have not seen myself. All of them begin life swimming free, and only settle down as they age.

The Annelides, or leeches and sea-worms, are pretty well-known. Leeches of several sorts exist in our tanks, but are not here a pest as in some other tropical countries.

A *Serpula*, very like one common at home, covers stones on the beach, oyster-shells, and so forth, with long white winding tubes. A large *Terebella* is pretty common on many strands. It collects shells and sticks, and more particularly bits of grass, to make a tube for itself to live in under the sand; and sometimes goes by the name of a "Sea-caddis." The use of the grass seems to be to anchor it in the sand. The whole tube, as it lies half exposed, looks more like the root of some plant than the dwelling of a worm. We have some very long smooth ribbon-like sea worms (which may be Nemertida), and one hairy species, looking very like a hairy caterpillar which takes up its quarters upon floating wreck or the like; but doesn't make itself fast in any way. The "lobworm" and "hairy bait" seem to be much the same as those at home; but they don't often come to hand, because they are not used here as bait, and there-

fore nobody has any motive for hunting them. I have not got any "Sea-mouse" here.

Of the Nematelmia, the most noticeable is the guinea-worm (*Filaria medinensis*) which is unfortunately very abundant. How it gets into the human body is not yet certainly known, but one consideration points to its getting through the skin. It has been known, though rarely, to attack the horse (and, I have heard, the dog). Now these creatures don't usually take as much care about what they drink as men do; and if drinking water was the usual vehicle of the guinea-worm, they might be expected to suffer much more frequently than men. But on the assumption that the worm gets through the skin, the comparative immunity of dogs and horses, which have much thicker skins than men (and also hair on them) is easily accounted for. European authorities consider that the guinea-worm doesn't appear until more than ten months or a year after it effects a lodgment. The natives, however, say that three months is sometimes enough; and the circumstances of a very bad outbreak in my own camp seemed to point to that period. Probably the time may vary. Dr. Bastian considers the guinea-worm to be only accidentally parasitic, and in that case, particularly, much irregularity in development would be natural enough.

The size of this worm is a good deal exaggerated in conversation; one of 30 inches is a good specimen. Nobody has ever seen a male guineaworm to swear to him; our unwelcome visitors are all "ladies in an interesting condition"; and the young, even if liberated in the tissues by the breaking of their parent in extraction, do not appear to grow. The common belief that they do is due to the frequent presence of several filariæ at one time in the patient, quite independent one of the other. The breaking of the worm, therefore, is by no means such a serious misfortune as people make out. The worst that comes of it is the prolongation of the business; and that, of course, is often quite bad enough. I knew of one case in which the worm was broken, and the greater part of it never extracted at all; but the wound healed over, and the patient suffered no more from it. The young, of course, were all or mostly removed by pressure on the wound.

Amongst the *Echinodermata*, I have not found here any *Holothuridae*, or "sea-cucumbers." Probably we have some, but their great head-quarters are in the Coral seas, whence they go to China under the name of trepang, or Bêche de mer, to be turned into soup.

Feather-stars (*Comatula*) are tolerably abundant, and so are the Brittle starfishes (*Ophiuroids*), but the Asteroids, or fleshy starfishes, don't abound here as they do on British coasts; and the sea urchins don't appear to be equal in size, variety, or number of individuals to those of northern seas. In a tide's work you may get half-a-dozen each of Echini and Asteroids, whereas at home you could fill a basket. I have seen raw sea-urchins eaten in Europe, where they are sometimes called "sea-eggs."

I have already said that we have no coral-reefs; and of corals, commonly so-called, such as Madrepores and Millepores we have but few; and the specimens are seldom large. The largest I have got were dead masses which had drifted some way. Some of these are so cellular that they can actually float; and I have found barnacles on them. Living cup-corals will grow upon floating objects. I have repeatedly found them upon drifted pumice; and once or twice upon driftwood; and I have one specimen in which three or four have grouped themselves on a dead broken stem of an Antipath, with young oysters and Balani.

The Antipathes, or Black corals, are found on some of our reefs. They are long rod-like things, with a blackish horny stem (sclerobase), whence they take their name in trade. But when alive this is covered with what looks like a warty bark, really the colony of zoophytes in which the life of the thing is. Some of ours reach 7 feet long, and are as thick as a drawing pencil; but elsewhere, and especially in the Red Sea, the stem attains an inch in diameter. The living "bark" (cænosarc) is often of very brilliant colour, red or yellow; and a handsome little species in Bombay harbour varies from orange to crimson. Besides these we have little gorgonias, or sea-shrubs, seldom (with us) exceeding a foot in height. One of the handsomest, which is of a deep crimson, rarely gets beyond six inches. Others are sulphur yellow, pink, or white. They keep their colour for some months when dry; but at last the "bark" dries and chips off, leaving only the horny stem, which is extremely durable. We have one very fine specimen from the African coast in this condition, five times as large as any I ever saw here, and even now a pretty object.

These things, while retaining their colour, look very well in a bouquet, a hat, or button-hole; and might be more used in decoration than they are. Sea-anemones (*Actinidæ*) are common on the reefs and on immersed timbers; and queer-looking mud-anemones

abound in the deep mud of some of the creeks. Others (with better taste) bury themselves in sea-sand. But none that I have got here were remarkable for beauty of colour. I might except one crimson mud anemone; but its shape and surroundings are so ugly that it is very far from being a lovely object.

In the mud, besides these, we find a rather curious object, looking like an earthworm with a backbone. This on extraction turns out to be a long calcareous rod, of the shape of a buggy whip, usually with the point turned or curled over. The creature sometimes reaches a foot in length, and the diameter of a swan's quill, and is probably related to *Virgularia*. We have many specimens.

The Medusæ, or Blubber fishes, are very common. I cannot myself distinguish these which are genuine from those which are merely stages in the reproduction of other creatures. A good many of them can sting and blister the human skin; and though the injury is not in itself dangerous, the fright and shock to the system of a man or boy suddenly stung in the water by an unseen enemy are sometimes serious. In some cases the sufferer is confused to an extent that puts him in some danger of drowning. A set of flannels is a complete protection. On the Irish coast, I have noticed that those blubbers which are almost colourless are harmless; the offending species have purple marginal spots. Here, *per contra*, the fishermen say that the colourless ones are the stingers, and the spotted innocent.

Another stinging thing is the "Portuguese man-o'-war," which consists of a longish bladder with several "polypites" and long tentacles and other organs hanging down from it, which steady it in the water, and do the fighting, feeding and love-making; in short, they are the boatswain tight and the midshipmite and the crew of the Portuguese man-o'-war. It is often driven ashore in great numbers; the polypites dry up to nothing; and the dry bladder lies on the sands till some one treads on it, and it goes off with a pop, startling if unexpected. Still commoner are the Velellæ, little round rafts with a semi-circular sail, and the crew, as before, hanging on the bottom. The fishermen call both of these "Flowers of the deep sea," from their beauty, delicacy, and pelagic habits.

Sponges of several sorts are not uncommon on the reefs, but none of them are of any size or beauty; and none are of any use for washing oneself with. I sometimes use them for packing delicate specimens in spirit. From the perforations I find in dead

oyster shells, I think that a parasitic sponge attacks the oyster, but I hav'n't caught him at it. This vermin would probably be allied to the northern Cliona, which does the same thing at home.

The true Sea-weeds (*Algæ*) are scarce and small here, and most of them not attractive in appearance. Nor do I know of any alga being used on this coast as human food or for manure; or in fact for anything at all. I don't know much about them; and Dr. Kirtikar and Mr. Birdwood have made the submarine flora of these seas their own.

Many years ago, Dr. Carter reported the organism which colours salt red in our Bombay Salt-pans as apparently identical with that which reddens snow in the Alpine and Arctic Regions (*Protococcus Nivalis*). This is now generally considered to be vegetable; though the embryo is free and locomotive.

The hot springs all down the Konkan contain peculiar Algæ, probably allied to those which Dr. Kirtikar found at "Wazrabai." They are most abundant, I think, at Unhere, one march from Nagotna, and not far from Pali. Northerly gales bring a drifting Sargassum with little bladders that look like berries (and are not) like *S. bacciferum* Like it, too, this species seems to live afloat.

Since I began these papers, Mr. Aitken has added to my list of birds one duck, *Mergus merganser*, from Bombay harbour, which, as he justly observes, is probably its most southern record.

Mr. Inverarity (in accordance with his promise), has added two ducks, the tufted pochard, which I had but doubtfully recorded, and the scaup. This last is probably also a most southern record. The truth is that we shall never know all about our ducks until somebody comes with a punt-gun; and this applies particularly to the more marine species. I got a young duck alive in September, which I think must have been a spot-bill; but before the question could be settled the badger broke loose and ate it up.

Mr. Inverarity also notes the true bittern, the little chestnut bittern, of both of which I *have seen local* specimens, since I began these papers, the black-tailed godwit (of which I find a very doubtful undated note in my copy of "Jerdon" as perhaps shot in Bombay Harbour), and the golden plover, which he has found in the sort of ground where I thought it might be, but in far greater numbers than I should have thought possible.* Clearly it is a regular visitor

* I have shot this bird since in the Kundlira Valley, 7th April 1887

to the coast. He has also identified one crake; there are probably more remaining for any one who will take them up.

As regards the bald coot, his observation confirms mine, that the want of water is the only thing that keeps it out of any part of the Konkan. Of the three tanks on which Mr Inverarity saw large flocks, each is the largest sheet of water in its taluka. I have no doubt that the bald coots may breed at Vehar, and probably they do so at Bhiwandi. At Panwell they don't.

As regards the purple coot, the notice is very interesting because, for three or four years previous to the famine, I was very intimate with the Bhiwandi water-works and Vehar lakes. The former, I should add, was then in its present form a new lake, having been greatly improved about 1873-4. Now in those years I never saw a purple coot upon either lake, so they must have been, at best, but rare visitors. Mr. Inverarity's notes appear to begin with the next season; the earliest date he gives is October 1887 (and this not for the present bird); and it will be remembered that the Deccan famine was followed by serious failure of rain in Gujarat, a great country for purple coots. This may have set them wandering south'ard, until some found out Vehar and Bhiwandi, and stayed there. I have, since that, seen this bird at Nagotna, and have noticed it, in Gujarat, to straggle a good deal in May; and as far as the climate goes, there is nothing to hinder it from being here, as it is found as far south as Ceylon.

We shall probably have both the coots breeding on the Tansa lake, if it is only protected.

The tank by the old cantonment at Kalyan has always been a great place for both species of Jacana; and I have no doubt they breed there or thereabouts. The Bronze-winged Jacana apparently breeds at one point near Panwell (on the road to the Kalhe Pass), at Nagotna, and at Ashtami; for you may see young birds there in all years. The woodcock shot near Tanna must have been a "straggler;" but I should think it possible that the woodcock occurs along the crest of the Ghats more frequently than we suppose. I never got one in India myself.

I have, in several places above, alluded to pumice stone as the abode of barnacles, annelides and corals, which may require explanation. The fact is, that two years after the great eruption of Krakatoa, pumice stone began to drift in to the Bombay coast in considerable quantities. It had got to the Seychelles the year before, so probably

what we got had first travelled to that neighbourhood on the S.-E. trades or some current; and then turned off with the S.-W. Monsoon of 1885. Our largest pieces were about as big as a boy's head. Those which came to the Seychelles were much larger, and so numerous as to encumber passages on the coast, and cause inconvenience (I was told) to boats.

In 1885, it was also reported from the Maldives, but whether it was then coming in, or was what had drifted and collected in previous years, is not clear. In 1884 it had been seen off the coast of Ceylon in great quantities.

KESWAL.

SOME BIRDS SEEN IN A JOURNEY THROUGH PERSIA.

By G. J. R. RAYMENT, A. V. D.

From Bushire to Shiraz through the Kashgai and Bakhtiari Highlands to Isfahan, by Ali Gudurz, Burujurd and Hamadhan to Sunneh in Kurdistan, thence to Kismanshah.

[As far as possible, Jerdon's nomenclature has been adhered to Birds not identified with certainty are marked thus (?)]

Gyps fulvus.—Large Tawny Vulture.—Throughout the country Specially numerous on a small hill, a few miles W. of Kismanshah.

Neophron percnopterus.—White Scavenger Vulture—Distribution much as above, but far rarer.

Gypætus barbatus.—Bearded Vulture, or Lammergeyer—Kashgai Bakhtiari Highlands, Highlands of W. Persia.

Falco sacer.—The Cherrug Falcon. Nihavand near Hamadhan. Western Persia.

Hypotriorchis æsalon.—The Merlin—Kashgai Highlands.

Tinnunculus alaudarius.—The Kestrel—Kamaraj and north to Shiraz, disappearing in higher altitudes of the Kashgai country, and again being observed in descending towards Isfahan; met with, though not often, in W. Persia.

Micronisus badius.—The Shikra—Bushire.

Accipiter nisus.—Kurdistan.

Aquila pennata.—The Dwarf Eagle—W. Persia.

Pandion haliætus.—The Osprey.—Bushire, Dahki,—(Foot of hills near Bushire) once at Gandaman, Bakhtiari Highlands.

Circus Swainsoni.—The Pale Harrier—W. Persia

Milvus govinda—(*M. Ater* ?) The common Pariah Kite—Between Bushire and Shiraz, Kashgai Hills and W. Persia, but very rare everywhere. Blandford in Eastern Persia considers it *M. ater* not *govinda*.

Athene bactriana. Owlet—near Shiraz, Kashgai Highlands. W Persia. It has a plaintive little cry, very different to the intolerable screech of *A. brama*.

Hirundo rustica.—Common Swallow—Common throughout the country in summer and autumn, disappearing in the cold weather. Breeding at Kazerun, S. of Shiraz, in June.

Hirundo fluvicola.—The Indian Cliff Swallow ? *H. daurica*)—Konarthuktah, 1800 ft. between Bushire and Shiraz in June. Blanford in Eastern Persia refers to this bird as *H. daurica*.

Chelidon urbica.—The English House Martin—Shiraz and South Kashgai Highlands. Breeding in immense numbers in June. I am not sure that it was not *C. Cashmiriensis*.

Cypselus melba.—The Alpine Swift—Shiraz, Kashgai Highlands, but rare; not seen in cold weather.

Cypselus alba—The European Swift—Very common in Shiraz and its neighbourhood; seen in Kashgai Highlands summer and autumn.

One species of *Caprimulgus* seen in Highlands between Bushire and Shiraz, but not identified, probably *C. Europæus*.

Merops viridis—The common Indian Bee-Eater.—Bushire and N. up to 2000 feet.

M. Ægyptius—The Egyptian Bee-Eater ? (*M. Apiaster*) ?—Common throughout the country in summer and autumn.

Coracias garrula—The European Roller—Hills N. of Bushire, Kashgai Hills, Isfahan, but rare.

Halcyon fuscus—The White Breasted Kingfisher—Daliki and Kazerun, N. of Bushire.

Alcedo ispida—Very like A. Bengalensis. The Common Indian Kingfisher—common on nearly all streams of any size and in the Isfahan gardens.

Ceryle rudis—The Pied Kingfisher—Khana Zunian, 6000 ft., near Shiraz, W. Persia near Kismanshah.

Picus Sancti Johannis—(St. John's Woodpecker)—W. of Isfahan.

Picus viridis—Shiraz, Isfahan.

Upupa epops—The European Hoopoe—Common throughout the country.

Lanius tephronotus—Shiraz. Breeding in June.

Cinclus aquaticus—White-breasted Dipper.—Koshru-Shireen, in Kashgai Highlands, Nargan W. of Isfahan.

Petrocopyphus cyaneus—Blue Rock Thrush—Hills near Shiraz.

Turdus Hodgsoni—Himalayan Missel Thrush? Ardakun in Kashgai Land.

Chatarrhæa caudata—Striated Bush Babbler?—Konarthuktah and Kazerun, between Bushire and Shiraz.

Otocompsa leucotis—The White-eared Crested Bul-bul. Bushire and North as far as Kazerun. Breeding in Bushire in June.

O. galbula—European Oriole—Very common in Isfahan.

Saxicola Ænanthe—The Wheat Ear—Kazerun between Bushire and Shiraz.

Ruticilla phœnicura—The European Redstart—Dashtiarjin, between Bushire and Shiraz, Ardakun in Kashgai Land, W. Persia.

Motacilla personata—Much resembles *M. luzoniensis*. The White-faced Wagtail.—Shiraz, Isfahan, W. Persia.

Motacilla sulphurea—The Grey and Yellow Wagtail—Common W. of Isfahan.

Parus major—The Enropean Tit—Shiraz, Kashgai, and valleys, W. Persia.

Corvus cornix—Hooded Crow—Common everywhere.

Corvus corax—The Raven—Common everywhere.

Corvus frugilegus—The Rook—Ali Gudurz, between Isfahan and Hamadhan.

Pica bactriana—The Magpie—Common all over the Highlands. Shiraz. Very common, Isfahan.

Garrulus atricapillus—Jay—S. of Shiraz.

Fregilus Himalayanus—The Himalayan Chough—Kashgai and Kashgai and Bakhtiari Highlands. Isfahan and W. Persia.

Sturnus vulgaris—The Common Starling.—Common everywhere. W. of Isfahan met with in immense flocks.

Passer Indicus—The Indian House Sparrow.—Common everywhere. I never observed the Mountain Sparrow, so common in Afghanistan.

Carduelis elegans.—The European Goldfinch—Common throughout the country in suitable localities. Breeding in Shiraz in June.

Galerida cristata—The Crested Lark—Shiraz, Lower valleys, Kashgai country, Isfahan, W. Persia.

Certhilauda desertorum—The Desert Lark?—Bushire.

Columba palumbus—The European Cushat—Common in the hills S. of Shiraz and Kashgai country, not seen in W. Persia.

Columba livia—(according to Blanford) The Blue Rock Pigeon—Common everywhere.

Pterocles arenarius—The Large Sand Grouse, common in all suitable localities.

Pterocles alchata—The Pintailed Sand Grouse—Near Hamadhan, in immense flights near Bushire in November.

Pterocles exustus—The Common Sand Grouse—Daliki,near Bushire.

Francolinus vulgaris—The Black Partridge—N. of Bushire, not extending to high altitudes.

Caccabis chukor—The Chukor Partridge—Common on all the higher hills.

Ammoperdix Bonhami—The Seesee Partridge—Met with on lower hills, N. of Bushire, Bukhtiari country, plentiful between Isfahan and Shiraz.

Coturnix communis—The Large Grey Quail—Common throughout the country, in higher altitudes during summer and early autumn.

Houbara Macqueenii—The Houbara Bustard—Bakhtiari country.

Cursorius gallicus—The European Courier Plover—Bushire, Kashgai Valleys. Rare.

Vanellus cristatus—The Crested Lapwing—Common in all suitable localities, more plentiful in winter.

Chetusia leucura—The White-tailed Lapwing—Near Shiraz.

Lobivanellus goensis—The Red-wattled Lapwing—N. of Bushire, Shiraz.

Œdicnemus crepitans—The Stone Plover—Alumabad in W. Persia

Grus cinerea—The Common Crane—W. Persia, S. of Isfahan.

Scolopax rusticola—The Woodcock—W. Persia, S. of Isfahan.

Gallinago scolapacinus—The Common Snipe—Common everywhere in suitable localities in winter. First seen on September 4, W. of Isfahan.

Gallinago gallinula.—The Jack Snipe—W. Persia, Shiraz.

Actitis hypoleucos—The Common Sandpiper—Kashgai country, W. of Isfahan.

Himantopus candidus—The Stilt—S. of Shiraz, W. Persia.

Porphyrio poliocephalus—The Purple Coot—Kazerun Lake S. of Shiraz.

Fulica atra—The Bald Coot—S. of Shiraz. Breeding Bakhtiari country, June and July.

Gallinula chlorophus—The Water-Hen—Kazerun, Lake S. of Shiraz. Kashgai country.

Ciconia nigra—The Black Stork?—Kurdistan.

Ardea purpurea—The Purple Heron—W. Persia.

Herodias garzetta—The Little Egret—Common in suitable localities.

Botauris stellaris—The Bittern—W. Persia.

Nycticorax griseus—The Night Heron—Isfahan and W. Persia.

Phœnicopterus minor—The Lesser Flamingo—One specimen seen at Dashtiarjin, June.

Anser cinereus—The Grey Goose?—Zargan, N. of Shiraz.

Casarca rutila—The Ruddy Sheldrake. The Chukwa.—Common throughout the country.

Anas boschas—The Mallard—Common throughout the country. Breeding in June and July.

Querquedula crecca—The Common Teal—Common everywhere, late in autumn and winter.

Athya nyroca—The White-eyed Duck?—Dashtiarjin, S. of Shiraz.

Podiceps cristatus—The Crested Grebe?—Dashtiarjin.

Podiceps phillippensis.—The Little Grebe—Common everywhere in suitable localities. Breeding in June and July.

Some Pelican seen at Dashtiarjin S. of Shiraz, but not identified.

A NEW SPECIES OF ZYGÆNA, FROM THE KURRACHEE HARBOUR.

By James A. Murray, of the Vict. Nat. Hist. Inst.

Zygæna dissimilis.—Sp. Nov.

Anterior edge of head sinuately curved. *No groove running along it.* Length of the hammer from eye to eye 26 inches; from the middle 13 inches. Each of its hind lateral expansions 10 inches; its width near the eye 6·5 inches or less than the length. Eye situated at the upper third of the external edge of the lobe of the head and two inches below the outer edge of the nostril. Teeth very slightly oblique, as broad at base as long, with an indistinct notch laterally and serrated on both edges to near the tip. They are convex before and behind, with an oblong nodose prominence mesially at the base on the outer surface. The 1st dorsal arises from a little more than an inch inside the extreme

hind edge of the pectoral fin; it is falcate in shape and measures along the curve to tip, 25 inches; the greatest width to hind prolongation at the base 15·75 inches. Pectoral fin 18 × 12 inches, or one-third longer than broad. Second dorsal arises from opposite the anal; it is triangularly concave behind, and not straight as depicted in the plate of *Zygœna malleus*, Blochu and *Ztudes* in Day's Fishes of India, and has also an elongated process at base. Ventral fin 11 × 10·5 inches, also triangularly concave behind, and not straight as in the *malleus*. Anal fins 7 × 11 inches, concave behind, the distance from its insertion to the tip of the elongate process of the ventral 5 inches. A pit at the root of the caudal, upper caudal lobe falcate, lower proportionately longer than in the other species. Colours brownish grey throughout, except a width of 10 inches on the under surface, where it is white, also the under surface of the hammer.

The following are the measurements of this species taken in the flesh:—

	Feet.	inches.
Total length to tip of upper caudal lobe ...	10	2½
Length of upper caudal lobe	3	1½
„ lower „ „	1	3½
Height of 1st dorsal over curve	2	1
„ „ (vertical) to tip	1	9
Width of „ to tip of elongate process	1	3
Height of 2nd dorsal	0	8
Width of „	0	11
Length of pectoral fin	1	6½
Width „ „	1	0
Length of ventral fin	0	11
Width of „ „	0	10½
Anal fin, length	0	7
„ „ width.....	0	11

Diameter of eye, 1·25 inches; width of mouth, 9·75 inches.

Hindmost (5th) gill opening smallest.

Locality.—Kurrachee. Captured on 20th April 1884.

This species differs from all the known forms, first, by having its teeth serrated on the edges instead of smooth; and, second, in having no prolonged groove along the entire front margin of the hammer. From *Z. Malleus* by the less curvature of the

head and less deep sinuous groove on the anterior edge of the hammer, also by the length of the hind margin of one side of the hammer being more than its greatest width near the eye, and also by the shape and position of the fins, especially the 2nd dorsal and ventral fins, which are concave behind instead of being straight. It is nearest *Z. Mokarran* (Gunther Cat. Fish B. M.), but the length of the hind margin of one of the lateral expansions is greater than the width near the eye, instead of being equal as in that species, and the anterior margin of the hammer does not form a right angle with the lateral lobe.

This makes the third species of Shark lately described from the Kurrachee harbour. The first is *Carcharias Murrayi*, Gunther, the next, *Lamna Guntheri*, Murray, and the present one the third. It is a question now whether these three species extend their range along the Beloochistan and Bombay Coasts.

NOTES ON PLOCEUS PHILIPPINUS.

By Lieut. H. Edwin Barnes.

The normal number of eggs laid by the Common Weaver Bird has been variously stated by different authors; some give two as the correct number, others as many as ten. Dr. Jerdon considered two as the usual number, and was of opinion that when six or more were found, they were the produce of two birds; Mr. Hume, in his *Nest and Eggs of Indian Birds*, page 438, gives his opinion in no uncertain terms. He says:—"With Dr. Jerdon I am perfectly convinced that two is the normal number of the eggs. I have certainly examined over a hundred nests, and *never* found more than three, and only two or three times more than two." This ought to be conclusive. Personally I have never found more than seven eggs in a nest, and this once only, five of them were much incubated, and the remaining two quite fresh; another nest had six, all fresh. With these exceptions, five is the usual number of eggs have met with, but I have also taken nests containing single incubated eggs. This is puzzling, but I believe I have found the key to the mystery; one day, while nesting in Neemuch, Rajpootana, I saw, amongst many others, a remarkably fine nest, which I determined to secure, but as the babool tree, in which it was, stood well out in a pool of water, it was a matter of some

difficulty; it contained five incubated eggs, and on searching the other nests on this tree, I found that in each case, when the eggs were incubated, the number was five also, any lesser number proved to be fresh. A few hundred yards away I came upon another colony, and on searching the nests, I found, them to contain from one to five incubated eggs; at the bottom of the tree, lay several good nests, that had evidently been cut down by squirrels, and in some of these I found eggs; here was the clue. Every one must have noticed the numbers of half-finished nests, in every colony, that for some reason or the other have been abandoned; what more likely than, the squirrels having cut down a nest, before the full complement of eggs had been laid in it, the birds should finish laying, either in one of the incompleted nests, to be afterwards completed or not, (I have often found eggs in these half-finished nests), or in one belonging to a neighbour. This theory accounts for a larger and a smaller number of eggs than usual being found in a nest. The squirrels were unable to get at the nests in the Babool tree standing in the water, and in consequence they had complete clutches of eggs in them. I intended watching this tree again during the following season, but having been transferred to Saugor, I could not do so, but soon after the breaking of the monsoon, I found not far from Saugor, a clump of babool trees in a similar situation, and as the bayás had commenced building upon them, I had an excellent opportunity of testing my theory, and later in the season, I found, as I had anticipated that the nests contained five eggs each, in a few cases four only. I am therefore fully persuaded that the normal number of eggs, in Rajputana and the Central Provinces at all events, is four or five, oftener five than four; this I know to be contrary to the generally conceived opinion, but I think that the facts I have adduced, go far to prove the correctness of my views. Mr. Hume, speaking of the nests themselves, says:—The long tubular entrances that the male often goes on building after the female is sitting reaches in one nest I have preserved to a length of 11 inches," and again "as a rule these entrance passages do not exceed six inches in length." A nest that I took at Saugor has the tube 25 inches long, another procured at the same time and place has it 24 inches, and strange to say, the lower portion is incorporated with an unfinished nest, evidently meant to steady it; this fact evinces more intelligence on the part of these birds,

(cute as I know them to be), than I should have given them credit for. Where does instinct end and reason begin? Far better had the birds trusted to instinct alone, for the very means used to steady the nest, gave a snake the opportunity to get in it, for while it was being cut down, one dropped out; and tried to escape in the long grass, but a smart tap on the back with a cane stopped its further career and it proved to be a Brown Tree Snake, (*Dipsas gokool*).

Its stomach contained a partly digested nestling, showing that it had been in the nest for some time, and had evidently meant to stay until its appetite returned, when no doubt it would have dined in due sequence off the remaining three, quite unconcerned and apparently ignorant of the dangerous nature of their self-invited guest. Full measurements of the large nest may not be devoid of interest to both ologists and ornithologists. The length, of the suspensory portion which is very thin, is 19 inches, the bulb 9 inches and the tube 25 inches, giving a total length to the nest of 53 inches. The diameter of the bulb is 6 inches one way and 4 inches the other.

The tube where it joins the bulb has a diameter of barely 2 inches, but it widens considerably at the end, and may be described as bell-mouthed. These nests are of course most of them now in the Bombay Natural History Society's Rooms.

A CATALOGUE OF THE FLORA OF MAHABLESHWAR AND MATHERAN.

By H. M. Birdwood.

"There is a pleasure in the pathless woods."

When offering to the Society the Catalogue of the Flora of Matheran, published at pp. 206-211 of Vol. I. of our Journal, I explained why it was so incomplete. It was compiled at a time of the year when many herbaceous plants were dried up and could not be recognized. I have now been able to enlarge it by adding the names of plants, seen, soon after the close of the last rainy season, at Mahableshwar, where a great part of the Flora is identical with that of Matheran; as might indeed be expected from the general similarity of the soil and climate of the two hills. There are, no doubt, certain causes regulating the distribution of plants which are not

equally operative at both places. Mahableshwar is about 70 miles nearer the Equator than Matheran. The latter is an isolated hill, rising from the plain of the Konkan, midway between the Western Ghâts and the sea; whereas Mahableshwar is further from the sea, and is, to all intents, a part of the range of Ghâts. The highest point of Matheran is about 2,500 feet above the sea-level; whereas the Mahableshwar plateau is at a general elevation of 4,500 feet above the sea, and at Sindola rises to 4,700 feet. These differing conditions are not without their effect. Some plants are found at Mahableshwar which will not thrive on the lower mountain-top. Some Matheran plants, on the other hand, find the higher levels of Mahableshwar beyond their range. I will give here only a few instances. The most casual observer is struck by the wonderful undergrowth of brake-fern at Mahableshwar, and of the arrow-root plant,—which in the months of October and November blooms on almost every square yard of the jungle,—and by the beautiful profusion of the *Osmunda* fern, mixed with brambles and willows, along the upper stream of the Yenna River. At Matheran, the brake-fern is scarcely known. In a few years it will perhaps be extinct; for it cannot defy the onslaughts of thoughtless fern-hunters who take away stray specimens to languish and die in Bombay or Poona gardens. It would be impossible for any number of fern-hunters to destroy it at Mahableshwar. Even if unmolested at Matheran, it drags on at best but a feeble existence. The site is too low for it, the lowest limit of its range in our latitude being probably at a line at least 2,000 feet above the sea level. The *Osmunda* again is not known at Matheran; nor is the willow; nor the arrow-root (*Curcuma caulina*), though other plants of the genus *Curcuma* are plentiful enough. I have certainly seen Mahableshwar raspberries in Matheran gardens; but they were not what raspberries ought to be. Again, there are some well-known Matheran trees, such as the Kumbha (*Careya arborea*), the Malia or Indian Ebony (*Diospyros assimilis*) and the Chandara (*Macaranga Roxburghii*), which do not grow on the Mahableshwar plateau at all. I have been in communication on this particular subject with Dr. T. Cooke, who has made the flora of Mahableshwar and Matheran a special study for many years, and I hope that he will favour the Society with the result of his observations embodied in a "Note" on this Catalogue, and give us lists of the more prominent plants on either hill which are not found on the other. After taking full account of these, it will

still be seen that very many of the plants included in the Catalogue are common to the two hills. Such a coincidence is favoured by the similarity of their geological formation and by the circumstance that there is no great difference in the range of their mean temperature at different seasons and in their rainfall. Both Mahableshwar and Matheran are, roughly speaking, huge masses of trap, capped by a thin layer of laterite. Both are within sight of the sea. Both are swept by the same dry winds in the cold weather and by the same monsoon storms, and both enjoy the full benefit of the monsoon rains. The average mean temperature ranges at Mahableshwar from 64° F. to 76°; and from 69° to 78° at Matheran. The average rainfall at Mahableshwar amounts to 263 inches; and at Matheran to 242 inches. Under such concordant influences, we find a general likeness in the forms of vegetation on the two hills, due to the frequent presence of the same characteristic plants on both. Everywhere at Mahableshwar, as at Matheran, we find the Myrtle tribe represented by endless woods of the beautiful Jambul tree (*Eugenia Jambolana*), the Melastomas by the Anjan (*Memecylon edule*), the Laurels by the Pisa (*Actinodaphne Hookeri*), and the Madder tribe by the thorny Gela (*Randia dumetorum*). There is the same undergrowth of shrubs and herbaceous plants, the natural orders of "Leguminosæ," "Acanthaceæ" and "Compositæ" being especially and numerously represented. There are many showy climbers and trailers and creepers common to both hills; as there are Orchids and Dendrobiums and other parasitic plants; while everywhere the little Silver-fern covers with equal impartiality every sheltered bank and rock. The flora of both Mahableshwar and Matheran can, therefore, be conveniently included in a single Catalogue. In the present Catalogue, which contains the names of 493 plants, while the former one contained only 218 names, I have included a few plants which are not actually found on either hill, but which are conspicuous enough to catch the eye of even the most rapid traveller on the well-worn road from Poona, by the Kartraj and Khandala Ghâts, to Panchgani and Mahableshwar. I could never have prepared so full a list without Dr. Cooke's help. He has kindly lent me his valuable Monograph on the Flora of Mahableshwar, of which I have endeavoured to make good use. He has also revised the proof-sheets of these pages, and added notes, where necessary. It only remains for me to add that this Catalogue is framed on the same general plan as the former one, and with the same object. It is meant,

with the aid of the appended index of vernacular names, to furnish a ready method of learning the scientific names of plants. Many visitors to the hills take an interest in learning those names even if they have no intention of undertaking the serious study of Botany in any of its various branches. With some, however, the interest thus acquired leads to further study, which becomes all the pleasanter for the knowledge which has been gained, without too much trouble, of the names by which the plants in which they are interested are known to the scientific world; just as it is pleasanter and more profitable to study the grammar of a new language after the student has acquired some portion of its vocabulary, and learnt to speak it a little, than before. For the use of those who wish to become better acquainted with the hill flora, and are disposed to correct the Catalogue or to add new names and notes to it, I have asked Mr. Sterndale to issue a few interleaved copies in pamphlet form, which can be procured from the Secretary.

CATALOGUE.

NOTE.—In the first two columns, the nomenclature adopted for the first 74 Orders is that of Hooker's "Flora of British India," Vols. I.—IV., and Vol., V. Part I., which do not include Orders 75—99, represented in this Catalogue. The synonyms in the second column, in the case of plants belonging to the first 74 Orders, are the names under which the plants are described in Dalzell and Gibson's "Bombay Flora," or in Graham's "Catalogue." The words "Herb. Co.," after the name of a plant in this column, indicate that the Mahableshwar herbarium, presented to the Society by Dr. Theodore Cooke, contains a specimen of the plant. In the third column, the vernacular names are spelt according to the Hunterian system. The word 'vel' or 'yel,' which recurs frequently as a component part of a name, means a 'creeper' or 'climber.' The words 'lahan' and 'dhakta' (fem. 'dhakti') mean 'small,' 'motha' (fem. 'mothi') means 'big,' 'pandhra' means 'white,' 'kala' 'black,' 'tambda' 'red, and 'kadu' 'bitter.' 'The prefix 'ran' indicates a 'jungle' plant, or, as we should say, 'a wild plant,' though all the hill plants in the list are probably wild or indigenous on Mahableshwar or Matheran, with the exception perhaps of the large-flowered' yellow flax (Reinwardtia trigyna), the Indian raspberry (Rubus lasiocarpus), the strawberry (Fragaria vesca), the Brugmansia candida, the mulberry (Morus atropurpurea), and the Jack-tree (Artocarpus integrifolia). The Reinwardtia is said, however, by Major H. H. Lee, R. E., to be "found truly wild on Varandha Ghat" in the Satara District. ("Gazetteer of the Bombay Presidency," Vol. XIX. App. A.) The Morus atropurpurea of the Mahableshwar gardens is, perhaps, a variety of Morus alba, the home of which "is probably China." (Brandis.) According to Wight and Beddome, the Jack-tree is "wild in the mountain forests of the Western Ghats, ascending to 4,000 feet." But Dr. Brandis remarks that "regarding its native home there is yet some uncertainty."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
DIVISION A—VASCULARES.—(*Plants with woody fibre and cellular tissue*).		
CLASS I.—DICOTYLEDONES.*		
SUB-CLASS—1 THALAMIFLORÆ. †		
1 Ranunculaceæ (The Butter-cup Order.)	Clematis Gouriana, *Herb. Co.*	Mor-vel, Mor-yel, Ránjai. Traveller's joy. Matheran; Koyna Valley.
„	„ Wightiana	*ib.* Mahableshwar.
2 Dilleniaceæ	Dillenia pentagyna	Karambel, Dhákta Karmal.

* In the seeds of Dycotyledones there are always two cotyledons at least, and if there are two only they are always opposite.

† The differences of the four sub-classes into which De Candolle divides the class of Exogens or Dicotyledones "might be, in most cases, expressed thus:—

1. Polypetalous.
   Stamens hypogynous..... = *Thalamifloræ.*
   Stamens perigynous ..... = *Calyciflorœ.*
2. Monopetalous ..... = *Corolliflorœ.*
3. Apetalous ..... = *Monochlamydeæ.*

'It is, however, to be observed that some of the Calyciflorœ and Thalamifloræ have a monopetalous corolla. In this classification, the student proceeds from what

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
3 Anonaceæ. (The Custard-apple Order).	Uvaria Narum	Naram-panal.
,, ...	,, lurida	
,, ...	Bocagea Dalzellii, *Syn.* Sagerœa laurina.	Sajeri, Har-kinjal.
4 Menispermaceæ ...	Cocculus macrocarpus, *Herb. Co.*	Vátoli, Vát-vel, Wátan-yel.
,, ...	,, villosus *	Tán, Vásanvel. *Sans.* Vásadani.
,, ...	Cyclea peltata, *Herb. Co.*...	Pár-yel, Pádel.
5 Papaveraceæ	Argemone mexicana†, *Herb. Co.*	Mexican Poppy.
6 Cruciferæ. (The Cabbage Order.)	Nasturtium officinale, *Herb. Co.*	Water-cress.
,, ...	Cardamine subumbellata *Herb. Co.*	
7 Capparideæ	Capparis spinosa, *Herb. Co.*	Indian Caper. "The young flower buds are the capers of commerce." (Lee.)
,, ...	,, pedunculosa	Kolisna.
,, ...	,, longispina, *Herb. Co.*	*ib.*
,, ...	,, horrida	Near Alexander Point, Matheran.
8 Bixineæ (The Arnotto Order.)	Flacourtia Ramontchi,‡ *Herb. Co.*	Támbat *Sans.* Svádu Kantak.
9 Pittosporeæ	Pittosporum floribundum, *Herb. Co.*	Yekadi.
10 Polygaleæ.....	Polygala persicariæfolia ...	Mahableshwar Milk-wort.
11 Portulaceæ	Portulaca oleracea, *Herb. Co.*	Ghol-báji.
12 Tamariscineæ	Tamarix ericoides	Jao, Sarub, Saráta. Tamarisk. In the river bed, near Neral station.
13 Guttiferæ	Garcinia indica	Kokam, Rátambá. Wild Mangosteen.
,, ...	,, ovalifolia, *syn.* Xanthochymus ovalifolius.	Haldi. Matheran Gamboje tree.
,, ...	Ochrocarpus longifolius, *Syn.* Calysaccion longifolium.	Harkia, Surangí.

are considered the most perfectly organized Exogens to those which are least so. Thus all the parts are present and distinct from each other in Thalamifloræ; other things remaining the same, the stamens adhere to the calyx in Calycifloræ; the stamens join the petals and the petals each other in Corolliforæ; and in Monochlamydeæ, first the corolla disappears, and then, among the most incomplete orders, the calyx also ceases to be developed." (Lindley's "School Botany.") Orders 43, 44, 45 in this Catalogue are placed under "Calycifloræ," in accordance with De Candolle's arrangement. According to the plan adopted by Lindley, these orders would come under "Corolliforæ."

* The juice of the ripe berries of the *Cocculus villosus* "makes a durable bluish-purple ink. The leaves rubbed in water thicken into a green jelly. Roots and leaves used in native medicine." (Brandis.)

† The *Argemone* is a small American genus, of which this species is "naturalized throughout India." (Hooker.)

‡ The wood of *Flacourtia Ramontchi* "does not warp, is durable, and not attacked by insects. Combs are made of it; it is employed in turnery and for agricultural implements, and though not large, it is occasionally used for building." (Brandis.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
14 Dipterocarpeæ	Ancistrocladus Heyneanus.	Kardor, Kardori. A handsome climbing shrub, with large, smooth, elliptic leaves and hooked branches. Not uncommon at Matheran.
15 Malvaceæ. (The Mallow Order.)	Sida carpinifolia, *Herb. Co.*	Chikni. It "is used to make besoms, the twigs being at once supple and tough." (Lee.)
,, ...	Abutilon polyandrum	
,, ...	Urena sinuata	
,, ...	Hibiscus hirtus	
,, ...	Thespesia Lampas	Rán-bhendi, Lahán Bhendi. Wild Bhendy.
,, ...	Bombax malabaricum. *Syn.* Salmalia malabarica.	Sávar, Támbdi Sávar. Silk-cotton tree. *Sans.* Rakta-sálmali. The wood is "used for planking, packing cases, toys, scabbards, fishing-floats and for the lining of wells. * * The calyx of the flower-bud is eaten as a vegetable. The fruit is collected before it opens, and the cotton with which it is filled is used to stuff quilts and pillows." (Brandis.)
16 Sterculiaceæ.....	Sterculia urens*	Sáldhawal, Karai. Kuari.
,, ...	,, guttata	Goldor, Gordar, Kukar.
,, ...	,, colorata	Bhaikui, Khavas, Kaushi. The bark is "made into rope." (Brandis.)
17 Tiliaceæ. (The Linden Order.)	Grewia tiliæfolia	Dhámun. "Made into shafts, shoulder poles for loads, pellet-bows, handles, masts, oars, employed in carriage building. From the inner bark, cordage is made in Bombay. Twigs and leaves lopped for fodder. Fruit eaten, of an agreeable acid flavour." (Brandis.)
,, ...	,, Microcos, *Herb. Co.*	
,, ...	Erinocarpus Nimmoanus...	Chaura, Chor, Cher.
,, ...	Triumfetta pilosa	Kutre-vándre, *i.e.*, "Dogs and Monkeys."
,, ...	,, rhomboidea, *Herb. Co.*	Necharda.
,, ...	Elæocarpus oblongus, *Herb. Co.*	Kásu, Khás. At Lingmala and near "Temple Hall," Mahableshwar.
18 Lineæ	Linum mysorense, *Herb. Co.*	Bámburti, Wúndri. Yellow Flax.
,, ...	Reinwardtia trigyna	Abai. Large flowerod yellow flax. In gardens at Mahableshwar and Matheran.
19 Geraniaceæ. (The Cranesbill Order.)	Oxalis corniculata, *Herb. Co.*	Nálkarda. Yellow sorrel.

* The *Sterculia urens*, though not common, is conspicuous on the Matheran Ghát by its cream-coloured, pink and white, shining bark, the thin, transparent coating of which peels off "like that of the birch." Sitars (native guitars), are made of the wood. It yields a gum which is "sold under the name of *katila*, *katira*." The seeds are "eaten by Gonds and Kurkus in the Central Provinces." (Brandis.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
19 Geraniaceæ (*contd.*)	Impatiens acaulis, *Herb. Co.*	Lahán Terda, Berki. Stemless Balsam. Rare at Matheran. Not so rare at Mahableshwar, where it grows on wet rocks near streams. It is a small but handsome plant, with large, pale-mauve flowers. "Well worthy of a place in the conservatory." (Lee.)
,, ...	,, inconspicua	
,, ...	,, oppositifolia	Saumukh patri, Terda.
,, ...	,, Dalzellii, *Herb. Co.*	Yellow Balsam.
,, ...	,, Balsamina, *Herb. Co.*	Terda. Wild Balsam.
20 Rutaceæ (The Rue Order.)	Evodia Roxburghiana	
,, ...	Toddalia aculeata	
,, ...	Glycosmis pentaphylla, *Herb. Co.*	Kirmira.
,, ...	Murraya exotica, *var.* paniculata.	Pándri, Kunti. Below Chowk and Hart Points. Matheran. Rare.
,, ...	,, Kœnigii. *Syn.* Bergera Kœnigii. *Herb. Co.*	Kadhipát, Kadhi-nimb. Curry Plant.
,, ...	Atalantia monophylla, *Herb. Co.*	Mákad-limbu, *i.e.*, "Monkey lime."
21 Burseraceæ	Boswellia serrata. *Syn.* B. thurifera	Sálphali, Sálera, Halera. Frankincense tree. On the Kartraj and Khandala Ghâts, on the road to Mahableshwar.
,, ...	Garuga pinnata	Karak. "Bark employed for tanning, a gum exudes from it. The fruit is eaten, raw and pickled." (Brandis.) On Matheran Ghât.
22 Meliaceæ	Cipadessa fruticosa, *Syn.* Mallea Rothii.	Kartraj Ghât.
,, ...	Soymida febrifuga	Polára. Rohan. Bastard Cedar, Indian Red-wood. "The bark is bitter, and has been used as a substitute for cinchona bark." (Brandis.)
,, ...	Chloroxylon Swietenia ...	Lillu, Halda.
23 Olacineæ	Mappia fœtida (M. oblonga in *Herb. Co.*)	Gánera

Sub-Class 2.—Calycifloræ

24 Celastrineæ (The Spindletree Order.)	Gymnosporia Rothiana ...	Mothi Yekadi, Yekah, Yenkli.
,, ...	,, montana, *Syn.* Celastrus montana.	Yekadi.
,, ...	Hippocratea Grahami	Yeoti.
25 Rhamneæ (The Buckthorn Order.)	Ventilago madraspatana. .	Kán-vel. Lokhandi.
,, ...	Zizyphus xylopyrus	Guti, Ghuti. Hart Point, Matheran; and on the road to Garbet Point.
,, ...	,, rugosa. *Herb. Co.*	Toran.
,, ...	Scutia indica, *Herb.*	Chimat, "Wait-a-bit" thorn.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
26 Ampelideæ (The Vine Order.)	Vitis discolor, *Syn.* Cissus discolor.	Telicha-vel.
,, ...	,, tomentosa	Shend-vel.
,, ...	,, latifolia, *Syn.* Cissus latifolia.	Nádena.
,, ...	,, auriculata, *Syn.* Cissus auriculata.	Jangli Kájorni.
,, ...	,, lanceolaria	Kajgolicha-yel.
,, ...	Leea sambucina, *Syn.* L. staphylea, *Herb. Co.*	Dhindi, Dindi.
27 Sapindaceæ (The Soapwort Order.)	Hemigyrosa canescens. *Syn.* Cupania canescens	Karpa.
,, ...	Allophylus Cobbe, *Syn.* Schmidelia Cobbe. *Herb. Co.*	Tipan.
,, ...	Schleichera trijuga.*	Kosum, Kusam, Koham, Kocham.
,, ...	Nephelium longana, *Herb. Co.*	Wnmb. "Fruit size of a cherry, reddish or purple. Aril wholesome." (Lee). Koyna Valley, Mahableshwar
28 Anacardiaceæ (The Cashew Order.)	Mangifera indica	Amba. Mango tree.
29 Connaraceæ	Connarus monocarpus.....	Sundar.
30 Leguminosæ	Crotalaria vestita, *Herb. Co.*	
,, ...	,, triquetra, *Herb. Co.*	
,, ...	,, nana. *Herb. Co.*	
,, ...	,, retusa	Ghágri.
,, ...	,, Leschenhaultii.. *Herb. Co.*	Daeli, Dingala.
,, ...	Indigofera pulchella, *Herb. Co.*	Nerda. Wild Indigo. Near Yenna Falls, Mahableshwar.
,, ...	Geissapsis cristata	Barki.
,, ...	,, tenella	Lahán Barki.
,, ...	Zornia diphylla	Nál-Barga, Berki.
,, ...	*ib.*, *var.* zeylonensis	Barga, Berki.
,, ...	Smithia purpurea, *Herb. Co.*	
,, ...	,, setulosa, *Herb. Co.*	
,, ...	,, blanda, *Herb. Co.*	Mothi Berki.
,, ...	Alysicarpus vaginalis, *var.*, nummularifolius.	Dháktá Dhampta.
,, ...	,, longifolius ...	Dhámpta.
,, ...	Desmodium parviflorum, *Herb. Co.*	
,, ...	Erythrina indica	Pangára, Páramga.
,, ...	Butea frondosa†	Palas, Khákra. *Sans.* Palása. The "Flame of the Forest."
,, ...	Phaseolus trinervius, *Herb. Co.*‡	Mungir.

* In many parts of India, *lac* is produced on the young branches of the *Schleichera*. "In Oudh, this tree is lopped, and the twigs and leaves are used as cattle-fodder during the dry season. Oil is extracted from the seeds in South India and Ceylon." (Brandis.)

† The leaves of the Palas tree are given as fodder to buffaloes. The flowers are made, with alum, into the yellow dye used at the *Holi* festival. (Brandis.) This tree gives its name to the memorable plain of *Palasi*, vulgarly called "Plassey." (Birdwood's *Vegetable Products.*) It yields a *kino* and a *lac*. (*Ib.*)

‡ This plant is common throughout India. "The Seeds, said to be rich in nitrogenous principles, were largely used by the famine-stricken people." (Lisboa's *Useful Plants*).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
30 Leguminosæ(*contd.*)	Vigna vexillata, *Herb. Co.*	Birambol, Halula, Halunda. Indian Sweet Pea.
,, ...	Atylosia lineata, *Herb. Co.*	Rán Túr.
,, ...	Cylista scariosa. *Herb. Co.*	Rán Ghevda
,, ...	Flemingia strobilifera. *Herb. Co.*	Bondar.
,, ...	Dalbergia latifolia	Sisu, Siswa, Sisam, Táli. Blackwood tree.
,, ...	,, sympathetica ...	Pendguli-yel, Yek-yel. Ek-vel.
,, ...	,, volubilis	Alei.
,, ...	,, paniculata.....	Phánsi. Matheran Ghát.
,, ...	Mezoneurum cucullatum...	Rági.
,, ...	Wagatea spicata	Vagáti.
,, ...	Cassia fistula	Báhawa, Garmala. Indian Laburnum.
,, ...	Bauhinia racemosa	Apta. Wanráj.
,, ...	Bauhinia malabarica	Kánchan.
,, ...	,, Vahlii	Chámbuli.
,, ...	Acacia catechu.....	Khair. *Catechu* is manufactured from the wood.
,, ...	,, concinna	Chikakai, Shikakai.
,, ...	,, Intsia, *Herb. Co.*	
,, ...	Albizzia stipulata	Lulloi, Lacli.
,, ...	,, amara	Siras. *Sans.* Sarshapa. Near Alexander Point, Matheran.
31 Rosaceæ (The Rose Order.)	Pygeum Gardneri. *Syn.* P. zeylanicum, *Herb. Co.*	"The seeds smell strongly of prussic acid The kernels of the fruit said to be used for poisoning fish." (Lee.)
,, ...	Rubus moluccanus, *Syn.* R. rugosus, *Herb. Co.*	Indian Blackberry.
,, ...	,, lasiocarpus	Mahableshwar Raspberry.
,, ...	Fragaria vesca, *Herb. Co.*	Strawberry.
32 Crassulaceæ (The Stonecrop Order)	Bryophyllum calycinum. *Syn.* Kalanchoe pinnata. *Herb. Co.* ...	Pánphne, Pánjád.
33 Rhizophoreæ. (The Mangrove Order.)	Carallia integerrima ...	Phansi. Wild Jacktree.
34 Combretaceæ. ..	Terminalia belerica ...	Beheda, Vehela.
,, ...	.. chebula* ..	Harda. Chebulic Myrobolan tree.
.. ..	.. arjuna ..	Arjuna.
.. ..	.. tomentosa, var typica, *Syn.* T. glabra	Ain.
,, ...	Calycopteris floribunda. *Syn.* Getonia floribunda.	Bagvel, Yakshi.
,, ...	Combretum ovalifolium ...	Mád-vel.
35 Myrtaceæ. (The Myrtle Order.)	Eugenia caryophyllæa, *Herb. Co.*	
,, ...	.. Jambolana, *Syn.* Syzigium Jambolanum *Herb. Co.*	Jámbul, *Sans.* Jambu. Jambul tree.
,, ...	Careya arborea	Kumbha.

* "The Myrobolan tree is found throughout the Satara district, but in special abundance in the Mahableshwar forests. the hill soil apparently being well suited to its growth. The fruit, the Chebulic Myrobolan of commerce, is about the size of a damson, though more pointed at one end, of a deep green colour and contains a hard seed; when dry, it becomes blackish and very hard and shrivelled. It is not edible in its natural state; but when mixed with the *Beheda* and *Arla*, the powder is taken as a stomachic and mild aperient. The fruit is much valued in tanning and dyeing. ** It is also used * * in making an ink." (Dr. W. McConaghy, "Gazetteer." Vol. XIX., Appendix B. Note.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
36 Melastomaceæ.	Memecylon edule, *Herb. Co.*	Anjan. Iron-wood tree.
37 Lythraceæ. (The Loose-strife Order.)	Ammania baccifera *Herb. Co.*	"Rocks near water on the Ghâts. This is the plant so commonly called 'Heather' by visitors at Mahableshwar." (Lee.)
,, ...	Woodfordia floribunda, *Syn.* Grislea tomentosa.	Dhauri, Dhaút.
,, ...	Lagerstrœmia parviflora...	Nanah. Benteak tree.
,, ...	,, lanceolata	
,, ...	,, Flos-Reginæ ...	Táman.
38 Samydaceæ	Casearia graveolens	Bokháda.
,, ...	,, esculenta	Mori.
39 Cucurbitaceæ (The Gourd Order.)	Trichosanthes palmata, *Herb. Co.*	Kaundal.
,, ...	Cucumis trigonus	Kat-vel.
,, ...	Zehneria Baueriana, *Herb Co.*	Waráli. Mahableshwar Bryony.
,, ...	,, umbellata, *Herb. Co.*	Gomáti.
40 Begoniaceæ	Begonia crenata, *Herb. Co.*	
,, ...	,, malabarica.....	
41 Ficoideæ (The Fig-Marigold Order-)	Mollugo hirta, *Herb. Co.*	
42 Umbelliferæ	Hydrocotyle rotundifolia.	
,, ...	,, asiatica. *Herb. Co.**	Kárivana, Khopri, Kadu Kárandá. *Sans.* Bhráhmi.
,, ...	Pimpinella monoica, *Herb. Co.*	Bhálga.
,, ...	Peucedanum grande, *Syn.* Pastinaca grandis.	Báphli.
,, ...	Heracleum concanense, *Herb. Co.*	Pandi, Pinda. Near Elphinstone Point, Mahableshwar.
43 Rubiaceæ. (The Madder Order).	Adina cordifolia. *Syn* Nauclea cordifolia.	Hed.
,, ...	Stephegyne parvifolia. *Syn.* Nauclea parviflora.	Kalam. Near One Tree Hill, Matheran.
,, ...	Wendlandia Notoniana. *Herb. Co.*	
,, ...	Oldenlandia corymbosa. *Herb. Co.*	A small, much branched herb, with slender, pubescent stem and branches, linear, sessile leaves, and small white flowers. Very common at Mahableshwar on the sides of paths in October. (Cooke.)
,, ...	Anotis carnosa, *Syn.* Hedyotis carnosa.	
,, ...	Mussænda frondosa†	Bhutkes. Sárwad. Near Simpson Lake, Matheran.
,, ...	Randia dumetorum, *Herb Co.*‡	Gela. The fruit is used instead of soap by the hill people; and the pounded bark for poisoning fish. (Lisboa).

* An infusion of the leaves of this plant was used by the late Dr. Bhau Daji in his treatment of leprosy. The juice of the leaves is sometimes prescribed, in native medicine, for Epilepsy; and is also popularly believed to be a cure for stammering, and to stimulate the intellectual faculties, if taken daily.

† This showy shrub is not very common at Matheran. It can be readily identified by its conspicuous, white, calycine leaves and its small, golden-yellow flowers.

‡ The *Gela* is very common on the hills. It is variable in size, sometimes a small tree, generally a shrub, with numerous stiff branches armed with spines, and large, fragrant, white flowers slightly tinged with greenish-yellow.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
43 Rubiaceæ (*contd.*)	Canthium umbellatum, *Herb. Co.*	Arsul, Tupa.
,, ...	,, angustifolium ...	Cháp-vel.
,, ...	Vangueria spinosa, *Syn.* V. edulis, *Herb. Co.*	Alu. Indian Medlar.
,, ...	Ixora nigricans	Lokhandi, Atkura.
,, ...	Pavetta indica, *Herb. Co.*	Pápat. Pháphat. Matheran Coffee.
,, ...	,, hispidula, *var.* siphonantha.	
,, ...	Psychotria truncata	
,, ...	Rubia cordifolia. *Herb. Co.*	Itári. Indian Madder. The roots furnish the dye called Manjit. (Balfour's Botany.)
44 Compositæ	Centratherum phyllolæ-num, *Herb. Co.*	
,, ...	,, tenue	
,, ...	Lamprachænium micro-cephalum.	
,, ...	Adenoon indicum, *Herb. Co.*	Kusamb, Mothi Sonki.
,, ...	Vernonia cinerea	Mothi Sadori, Sahadevi.
,, ...	,, divergens. *Syn.* Eupatorium divergens, *Herb. Co.*	Bondar.
,, ...	Adenostemma viscosum, *Herb. Co.*	Jirao, Jangli Jirao.
,, ...	Ageratum conyzoides, *Herb. Co.*	
,, ...	Dichrocephala latifolia, *Herb. Co.*	
,, ...	Cyathocline lyrata	Gangotri.
,, ...	Conyza stricta	
,, ...	Blumea glomerata, *Syn.* B. holosericea	Bhámburda.
,, ...	Gnaphalium luteo-album .	
,, ...	Vicoa cernua	
,, ...	Wedelia urticæfolia, *Syn.* Verbesina biflora, Wollastonia biflora.	Sonki.
,, ...	Spilanthes Acmella	
,, ...	Bidens pilosa. *Syn* B. Wallichii.	
,, ...	Tridax procumbens, *Herb. Co.*	
,, ...	Artemisia parviflora, *Herb. Co*	Dauni.
,, ...	Gynura nitida, *Syn.* G. simplex, *Herb. Co.*	Dáhn. Sow-thistle
,, ...	Notonia grandiflora. *Syn.* Cacalia Kleinii.	Cabbage tree. Khandala Ghát, near Mahableshwar.
,, ...	Senecio Lawii	
,, ...	,, Grahami	Sonki.
,, ...	,, belgaumensis, *Syn.* Madacarpus belgaumensis.	
,, ...	Calendula officinalis	Makmal. Marigold. Kartraj and Khandala Ghâts.
,, ...	Tricholepis glaberrima, *Herb. Co.*	Motha Búr, Bur. Fitzgerald Ghát and near Bombay Point, Mahableshwar.
,, ...	Lactuca Heyneana	Wild Lettuce.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
45 Campanulaceæ.....	Lobelia trigona, *Herb. Co.*	
,, ...	Lobelia nicotianæfolia, *Herb. Co.*	Dhá wal, Devnal. A tall, erect plant, with hollow stems, and large, light-green, lanceolate leaves, and a dense terminal raceme of white flowers. Seeds small, ellipsoid, acrid.
,, ...	Cephalostigma flexuosum..	
,, ...	Wahlenbergia gracilis ...	
	SUB-CLASS 3.—COROLLIFLORÆ.	
46 Myrsineæ	Moesa indica. *Herb. Co.*...	Atki, Atak.
,, ...	Embelia ribes, *Syn.* E. glandulifera, *Herb. Co.*	Waiwarang.
,, ...	,, robusta, *var.* ferruginea, *Syn.* E. Basaal.	Ambti.
,, ...	,, *Sp.?*	Kháprí Yel.
47 Sapotaceæ.....	Sideroxylon tomentosum, *Syn.* Sapota tomentosa, *Herb. Co.*	Káuta-Kumbal.
,, ...	Bassia latifolia	Mavra, Mohova. Mowrah Tree. Matheran Ghát.
,, ...	Mimusops Elengi	Bokul, Bakuli. Below Simpson Lake, Matheran.
48 Ebenaceæ	Diospyros montana, *Syn.* D. Goindu.	Goindu.
,, ...	,, assimilis, *Syn.* D. nigricaus.	Malia. Indian Ebony.
49 Styraceæ	Symplocos Beddomei *Syn.* Hopea racemosa. *Herb. Co*	Hurá, Lenda. Koyna Ghát.
50 Oleaceæ	Jasminium arborescens. *var.* latifolium, *Herb. Co.*	Kusar. Matheran Jasmine.
,, ...	Olea dioica	Pár Jámbul, Párjam. Wild Olive.
,, ...	Ligustrum neilgherrense, *Herb. Co.*	Lokhandi, Mersingha. Mahableshwar Privet.
51 Apocynaceæ. (The Dogbane Order.)	Carissa Carandas..	Karvand, Corinda. Corinda Bush.
,, ...	Rauwolfia densiflora, *Herb. Co.*	
,, ...	Holarrhena antidysenterica.	Kuda. *Sans.* Kutaja. The seed is called Indrajava (*Sans.* Indrayava) and is used as a vermifuge and febrifuge.
,, ...	Tabernæmontana dichotoma.	Taital.
,, ...	,, crispa	Pándhra Kúda.
,, ...	Wrightia tinctoria	Ḳála Kuda.
,, ...	Anodendron paniculatum.	Lámtáni. Dr. MacDonald's "Seed-Traveller." See the Society's Journal, Vol. I., p. 237.
52 Asclepiadeæ. (The Milkweed Order.)	Calotropis gigantea	Rui, Ark. Madár.
,, ...	Gymnema silvestre.* *Herb. Co.*	Kaoli, Pitáni, Dodi, Dudhroli Sirdoli.

* The leaves of this climber have the property, when chewed, of neutralizing for a time, the taste of saccharine substances. It may be identified by its slender green branches and numerous dense umbels of yellowish green flowers rather than by its most common vernacular name, Kaoli, which is applied to many of the twining asclepiads. (Cooke.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
52 Asclepiadeæ (*contd.*)	Dregea volubilis *Herb. Co.*	Kaoli. Near the top of the Rotunda Ghát and at Babington Point, Mahableshwar.
„	Dischidia bengalensis	
„	Hoya retusa	Dhákti Ambri. Golden Fringe.
„	„ Wightii. *Syn.* H. pallida.	Ambri, Dudh-vel. Wax plant.
„	Leptadenia reticulata ...	Khár-Khodi.
53 Loganiaceæ	Buddleia asiatica, *Herb. Co.*	
„	Strychnos colubrina	Kanal. Kájar-vel. Strychnine Creeper. Near Simpson Lake, Matheran.
„	„ potatorum	Niwali, Nirmali. Near Hart Point. Matheran.
54 Gentianaceæ.....	Exacum bicolor	
„	„ Lawii	Jatáli. Mahableshwar Gentian. Very common amongst grass in October; dies very soon after the end of the rains. (Cooke.)
„	„ petiolaret	
„	Canscora diffusa	Common along shady roadsides, both at Matheran and Mahableshwar. (Cooke.)
„	Swertia decussata	Kauri. Flowers in November, in grassy places. Tolerably abundant in the fields between the Satara Road and Lingmala, Mahableshwar. Used as a febrifuge. (Cooke.)
55 Boragineæ	Trichodesma zeylanicum...	
„	Paracaryum cælestinum. *Syn.* Cynoglossum cælestinum. *Herb. Co.*	Nechurdi. Mahableshwar "Forget-me-not."
„	„ malabaricum. *Herb. Co.*	
„	„ Lambertianum. *Herb. Co.*	
56 Convolvulaceæ ...	Argyreia sericea	Gavel.
„ ...	„ malabarica	
„ ...	Lettsomia setosa, *Syn.* Argyreia setosa.	Gárud-vel.
„ ...	Ipomæa dissecta, *Syn.* I. coptica.	
„ ...	Porana malabarica, *Syn.* P. racemosa, *Herb. Co.*	Bhanri. The "Snow creeper." Flowers in October and November, in many parts of Mahableshwar, and along the Garbet Road, Matheran. Flowers small, funnel-shaped, pure white. The dry scariose calyx is often seen on the withered plants in the hot season. (Cooke).
57 Solanaceæ. (The Potato Order.)	Solanum nigrum	Kámani. Common in gardens below the bazaar, and below the lake, Mahableshwar. (Cooke).
„	„ denticulatum, *Herb. Co.*	Karad Kángoni.
„	„ giganteum, *Herb. Co.*	Kntri.
„	„ indicum, *Herb. Co.*	Chiturti, Bhui-vángi.
„	Nicandra physaloides	Kartraj Ghát.
„	Datura fastuosa, *var* alba.	Dhotra.
„	Metel?	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
57 Solanaceæ. (*contd.*)	Brugmansia candida, *Herb. Co.*	Motha Dhotra. (Not described in Hooker's "Flora of British India").
58 Scrophularineæ. (The Figwort Order)	Limnophila racemosa	
,, ...	,, gratioloides ...	
,, ...	Herpestis Monniera, *Herb. Co.*	Flowers in April and May.
,, ...	Bonnaya veronicæfolia ...	Shewál.
,, ...	Striga orobanchioides* ...	
,, ...	Ramphicarpa longiflora ...	
,, ...	Centranthera hispida	
,, ...	Sopubia delphinifolia, *Herb. Co.*	
,, ...	Pedicularis zeylanica	
59 Lentibulariaceæ ...	Utricularia albo-cærulea, *Herb. Co.*	Kájutcha-ghás. Not very common. Grows in patches in the wet grass near the Dhobi's Waterfall, Mahableshwar.
,, ...	,, cærulea	Bladder-wort.
60 Bignoniaceæ	Hetrophragma Roxburghii, *Herb. Co.*	Wáras.
,, ...	,, adenophyllum ...	Pádel.
61 Acanthaceæ	Thunbergia fragrans	Eri-yél.
,, ...	Hygrophila Serpyllum. *Syn.* Physichilus Serpyllum, *Herb. Co.*	Rán-tewan.
,, ...	Phaylopsis parviflora, *Syn.* Ætheilema reniforme.	Waiti.
,, ...	Dœdalacanthus purpurascens, *Syn.* Eranthemum nervosum.	
,, ...	Strobilanthes asperrimus..	Kárvi. Indian Wattle.
,, ...	,, Heyneanus.	Ankra.
,, ...	,, ixiocephalus, *Syn.* S. Neesianus.	
,, ...	,, callosus. *Herb. Co.*	
,, ...	,, perfoliatus..	
,, ...	Calacanthus Dalzelliana, *Syn.* Lepidagathis grandiflora.	Matheran. Flowers large, purple.
,, ...	Blepharis asperrima. *Herb. Co.*	Pahádi-atgan.
,, ...	Barleria Prionitis	Common at Matheran. Flowers yellow.
,, ...	,, grandiflora	Matheran. Flowers large, white.
,, ...	,, courtallica	Itári.
,, ...	,, strigosa, *var.* terminalis, *Herb. Co.*	Koránti. Flowers in November. Flowers blue, the tube of the corolla much paler than the limb. Stigma purple. A handsome, showy plant.
,, ...	Asystasia violacea	
,, ...	Haplanthus verticillaris. *Herb. Co.*	Kála kírát, Kála ánkra.
,, ...	Lepidagathis cuspidata. *Herb. Co.*	

* This strange-looking little plant may be readily identified by its dark, reddish-purple stem, branches, and scale-like leaves, and its terminal spike of pink flowers, which have a white spot at the base of each division of the corolla. It grows on rocks and is sometimes parasitical on the roots of other plants. It flowers in November.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
61 Acanthaceæ. (*contd.*)	Justicia trinervia, *Syn.* Adhatoda trinervia.	Súta. Near Elphinstone Point, Mahableshwar; abundant.
,, ...	,, procumbens. ... *Herb Co.*	Tharambal.
,, ...	Ecbolium Linneanum, *Syn.* Justicia ecbolium.	Dhákta-adulsa.
,, ...	Rungia parviflora, *Herb.Co.*	
,, ...	Dicliptera zeylanica, *Syn.* D. bivalvis, *Herb. Co.*	
62 Verbenaceæ	Callicarpa lanata, *Syn.* C. cana. *Herb. Co.*	Yesur, Eshwar.
,, ...	Tectona grandis	Ság, Ságwán. Teak tree.
,, ...	Premna coriacea, *Syn.* P. scandens.	Chámbar-vel.
,, ...	Gmelina arborea.....	Shewan. The pale yellow, close-grained wood of this tree is highly esteemed for planking, furniture, the panels of doors &c. (Brandis.)
,, ...	Vitex negundo. *Herb. Co...*	Nigud, Nigadi. *Sans.* Nirgundi. The leaves are aromatic. In native medicine, the bruised leaves are applied to the temples as a cure for headache. (Cooke.)
,, ...	,, leucoxylon	Koyna Valley.
,, ...	Clerodendron serratum. *Herb. Co.*	Bornngi, Borsangi, Bhárang. Near the dharmsala, between Mahableshwar and Panchgani.
63 Labiatæ	Plectanthrus Wightii	
,, ...	Coleus parviflorus?	Kháprí. Near Elphinstone Point, Mahableshwar.
,, ...	Lavandula Gibsoni	Indian Lavender. On the Ghâts on the Mahableshwar road.
,, ...	Pogostemon parviflorus. *Syn.* P. purpuricaulis, *Herb. Co.*	Pángla, Pángli. As to the use of the leaves of this plant, as a supposed cure for snakebite, see the note at p. 210 of Vol. I. of the Society's Journal.
,, ...	Dysophylla myosuroides *Herb. Co.*	Shewal.
,, ...	,, salicifolia ..	
,, ...	,, stellata	Marvá.
,, ...	,, gracilis. *Herb Co.**	
,, ...	Colebrookia oppositifolia *Syn.* C. ternifolia. *Herb Co.*	Bhámau.
,, ...	Micromeria stellata. *Syn.* M. Malcolmiana. *Herb. Co.*	Karwat.
,, ...	Salvia plebeia	
,, ...	Scutellaria discolor. *Syn.* S. indica.	

* *Dysophylla gracilis* is probably only a tall form of *D. stellata*. (Hooker, Vol. IV. p. 641). The latter plant can be readily known, when in flower in October, by its narrow, linear, whorled leaves, and its slender spikes of minute, closely-packed, dark purple flowers. It grows in patches on the roadside near Sydney Point, Mahableshwar.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
63 Labiatæ (*contd.*) ...	Anisomeles Heyniana.....	Chaudhára.
,, ...	,, ovata.....	
,, ...	,, malabarica ...	On the Kartraj Ghát. Flowers in November. This beautiful plant can be readily identified by the snow-white, appressed wool which clothes its stem and branches, by its large, thick leaves and its dense whorls of pale-purple flowers.
,, ...	Leucas stelligera. *Herb. Co.*	Guma, Borambi.
,, ...	,, ciliata *Herb. Co.* ...	Borambi. Mahableshwar Dead Nettle. Flowers in the cold season. Not so common as L. stelligera. May be identified by the short, dense, yellowish brown hairs on the helmet-shaped upper lip of the corolla (Cooke.)
,, ...	Teucrium tomentosum ...	
	Sub-Class 4.—Monochlamydeæ.	
64 Plantagineæ.....	Plantago major. *Herb. Co.*	English plantain.
65 Amarantaceæ	Celosia argentea. *Herb. Co.*	Quail grass.
,, ...	Achyranthes aspera. *Herb. Co.*	Saráta. Burr plant.
,, ...	Alternanthera sessilis. *Herb. Co.*	
66 Chenopodiaceæ. (The Goose-foot Order.)	Chenopodium ambrosoides	Dauni.
67 Polygonaceæ. (The Buck-wheat Order.)	Polygonum plebejum, *var.* elegans.	
,, ...	,, glabrum	Sheral. In the lake, Mahableshwar with the next species.
,, ...	,, barbatum. *Syn.* P. rivulare.	Dhákta Sheral.
,, ...	,, alatum *Herb. Co.*	
,, ...	,, chinense. *Herb Co.*	Nárali, Paral. Indian Buck-wheat. Very common everywhere at Mahableshwar.
68 Piperaceæ.....	Piper Hookeri	Dongri Mirchi. Hill pepper.
,, ...	,, sylvestre	
,, ...	Peperomia portulacoides...	Gúlúm.
69 Laurineæ. (The Laurel Order.)	Machilus macrantha *Syn.* M. glaucescens.	
,, ...	Actinodaphne Hookeri, *Syn.* A. lanceolata, *Herb. Co.*	Pisa.
,, ...	Litsæa tomentosa, *Syn.* Tetranthera apetala.	
,, ...	,, polyantha, *Syn.* Tetranthera monopetala.	Kála-Pisa.
,, ...	,, Stocksii, *Syn.* Tetranthera lanceæfolia.	
,, ...	,, fuscata	
,, ...	,, zeylanica	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
70 Thymelaceæ.....	Lasiosiphon eriocephalus, *Syn.* L. speciosus, *Herb. Co.*	Rametá. Plentiful on little Chauk Point, Matheran, and common on both hills. The bark, which has a very strong fibre, is used by the hill coolies for tying bundles of grass and wood. Used also for poisoning fish.
71 Elæagnaceæ	Elæagnus latifolia, *Syn.* E. Kologa, *Herb. Co.**	Ambulgi.
72 Loranthaceæ (The Mistleto Order.)	Loranthus Wallichianus ...	The name Bánda or Vánda is commonly given to all these parasitic plants.
,, ...	,, obtusatus, *Herb. Co.*	
,, ...	,, cuneatus, *Herb. Co.*	
,, ...	,, elasticus, *Herb. Co.*	
,, ...	Loranthus involucratus ..	Bandguli.
,, ...	,, lageniferus	
,, ...	,, loniceroides ...	
,, ...	Viscum angulatum, *Herb. Co.*	Indian Mistleto.
73 Santalaceæ (The Sandalwood Order.)	Osyris arborea, *Syn.* O. Wightiana, *Herb. Co.*	Lotal.
74 Balanophoreæ	Balanophora	The genus is inserted on the authority of Mrs. Hart's "Note on a supposed Root-Parasite found at Mahableshwar in October, 1885." See the Society's Journal, Vol. I., p. 75. †
75 Euphorbiaceæ (The Spurgewort Order)	Euphorbia Rothiana. *Herb. Co.*	Dúdhi.
,, ...	,, nereifolia	Thor.
,, ...	,, parviflora	
,, ...	,, acaulis.....	Kirkind.
,, ...	Homonoyia riparia, *Herb. Co.*	
,, ...	Bridelia retusa, *Syn.* B. montana *Herb. Co.*	Hasána, Asána.
,, ...	Phyllanthus madraspatana.	Kanocha.
,, ...	,, lanceolarius *Herb. Co.*	
,, ...	Flüggea leucopyrus.....	Pándharphali.
,, ...	Tragia involucrata. *Herb. Co.*	Kúlti. Sting-nettle Creeper.
,, ...	Macaranga Roxburghii ...	Chandára.

* This beautiful species is very variable in habit, taking the form of either a bush, a small tree or a climber (Hooker). At Matheran, it is generally found as a large climber and is readily identified by its oblong, elliptic leaves, which are silvery-white or rusty-red beneath.

† Mr. W. E. Hart gives the following description, from memory, of the specimens collected by him. "My specimens approach the description of *B. indica* nearer than any of the others" (See Hooker, Vol. V. pp. 237, 238.) "The rootstock was tuberous or warty. The peduncle-scales yellowish. * * * They lay close on the peduncle, and * * were imbricate, but separated at the upper extremities. The heads were certainly globular and 1-sexual, reddish brown in colour. The flowers were dicecious, white in colour. The stamens of the male flower united into a central column of conical shape. The peduncles were of all lengths from 1 to 6 inches high, and decidedly thick for their length. The heads were of all sizes from marbles to bagatelle balls."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
75 Euphorbiaceæ (*contd*).	Mallotus philippinensis, *Syn.* Rottlera tinctoria, *Herb. Co.*	Rohen, Ruen, Kapila, Shendri.
,, ...	Croton hypoleucos	Pandurai.
,, ...	,, Lawianus	Borambi.
,, ...	,, ramiflorum	Kávala.
,, ...	Ceratogynum rhamnoides..	Chickli.
,, ...	Phyllanthus Emblica	Awal. Gooseberry tree.
,, ...	,, lanceolarius, *Herb. Co.*	Bhoma.
76 Urticeæ (The Nettle Order).	Elatostemma oppositifolia.	
,, ...	Fleurya interrupta.	Khájoti.
,, ...	Gerardina heterophylla... *Herb. Co.*	Mothi Khájoti, Agia, Agarra.
,, ...	Splitgerbera scabrella. ...	
,, ...	Debrigascea longifolia. ...	
,, ...	Trema Wightii, *Syn.* Sponia Wightii, *Herb. Co.*	Gol.
,, ...	Ficus heterophylla.....	
,, ...	,, oppositifolia.	Kharoti.
,, ...	,, bengalensis.....	Wad. Banyan tree. Below Chowk Point.
,, ...	,, religiosa *var.*?	Ashta.*
,, ...	,, infectoria	Kel.
,, ...	,, retusa.....	Nándruk, Ránekuit.
,, ...	,, cordifolia	Pahir.
,, ...	,, volubilis.....	Datir. Climbing Fig.
,, ...	,, glomerata	Umbar. *Sans.* Udumbar. The Sycamore tree of the Bible.
,, ...	,, asperrima	
,, ...	Morus atropurpurea	Situt, Shah-tut. Mulberry.
,, ...	Artocarpus integrifolia ...	Phanas. *Sans.* Panasa. Jack-tree.
77 Salicaceæ	Salix tetrasperma. *Herb. Co.*	Walunj. Willow.
78 Gnetaceæ	Gnetum scandens	Umli.

CLASS II.—MONOCOTYLEDONES.†

SECTION I.—*Stamens epigynous.*

79 Orchideæ	Oberonia recurva.....	
,, ...	Microstylis Rheedii. *Herb. Co.*	
,, ...	Dendrobium Lawanum, *Herb. Co.*	Bechu. This name is commonly given to all Dendrobiums.
,, ...	,, Macræi	
,, ...	,, ramosissimum.	
,, ...	,, microbolbon..	
,, ...	,, chlorops	
,, ...	,, barbatulum. *Herb. Co.*	
,, ...	Cirrhopetalum fimbriatum.	The "Umbrella orchis"; so named by Mrs. Jerdon.
,, ...	Eria braccata	

* The Ashta is distinguished by the hill people from the Pipal of the plains, of which it is perhaps a variety. The name "Ashta" has no connection, apparently, with the Sanskrit name of the Pipal, "Ashvatth."

† In the seeds of Monocotyledones there is generally only one cotyledon. If there are two, they alternate with each other. The natural orders in this class are arranged according to the plan adopted in Part. II. of Loudon's Encyclopædia of Plants.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
79 Orchideæ (*contd.*)...	Micropera maculata	
,, ...	Eulophia bicolor	Ambarkhand.
,, ...	,, pratensis. *Herb. Co.*	
,, ...	Ærides crispum	Rukhsing.
,, ...	,, Lindleyana.....	
,, ...	,, maculosum	
,, ...	Habenaria candida. *Herb. Co.*	Kalábi.
,, ...	,, platyphylla. *Herb. Co.*	
,, ...	Platanthera Susannæ. *Herb. Co.*	Only one plant of this splendid orchis has been found by Dr. Cooke at Mahableshwar, and only one at Matheran.
80 Burmanniaceæ.....	Burmannia triflora. *Herb. Co.*	On the road to the Governor's Bund, Matheran. Near the Dhobi's Waterfall, Mahableshwar.
81 Scitamineæ	Zinziber macrostachyum *Herb. Co.*	Sheri. Nisam. Wild Ginger.
,, ...	Curcuma zedoaria	Kachora, Kachola.
,, ...	,, pseudomontana..	Rán-haldi. White turmeric.
,, ...	,, caulina,**Herb. Co.*	Chávar. Arrowroot.
82 Musaceæ	Musa ornata	Rán-kel, Cháwankel, Kawadar. Wild plantain.
83 Amaryllideæ	Pancratium parvum.....	Khandálu.
,, ...	Cirnum asiaticum	
,, ...	,, brachynema	Mahableshwar Lily.
84 Hypoxideæ	Curculigo malabarica	Kajuri.
,, ...	,, graminifolia.....	
85 Dioscoreæ	Dioscorea pentaphylla.....	Shend-vel. Shendon-vel.
,, ...	Helmia bulbifera	Kadu-karanda, Nor-vel.

SECTION 2.—*Stamens perigynous.*

68 Asphodeleæ	Asparagopsis sarmentosa. *Herb. Co.*	Ashwal. Asparagus creeper.
,, ...	Chlorophytum breviscapum.	Kula.
,, ...	,, Nimmonii. *Herb. Co*	
87 Smilaceæ	Smilax ovalifolia. *Herb. Co.*	Got-vel.
88 Liliaceæ	Ledebouria hyacinthina ...	
,, ...	Anguillaria indica	
89 Commelineæ	Commelyna communis ...	
,, ...	Aneilema axillaris	Dhákti Káju.
,, ...	,, tuberosa	Káju. Spider-wort
,, ...	Cyanotis axillaris.....	
,, ...	,, longifolia	
,, ...	Valisneria spiralis	
90 Eriocauleæ	Eriocaulon setaceum	Gondali.
91 Palmæ (Palms) ...	Caryota urens	Bherli-mád. Fish-tail Palm. For the derivation of the Marathi name, see the note at p. 211 of Vol. I. of the Society's Journal.

* The *Curcuma caulina*, from which arrowroot has been obtained, grows abundantly everywhere at Mahableshwar. It flowers in October, and seeds freely in November.

Natural Order.	Genus and Species.	Vernacular or English name use, habitat, &c.
	SECTION 3.—*Stamens hypogynous.*	
92 Gramineæ (Grasses)	Coix lachryma	Kasai, Rán-makai. Job's Tears.
,, ...	Panicum prostratum	
,, ...	Isachne elegans	Dúnda.
,, ...	Oplismenus colonus.....	Kurund.
,, ...	Arundinella tenella	
,, ...	,, stricta	
,, ...	,, spicata.....	
,, ...	Setaria glauca	Kolára.
,, ...	Cynodon dactylon	Dúrba. Hariáli grass.
,, ...	Eragrostis unioloides	
,, ...	Bambusa stricta	Váns, Bámbu, Udha. *Sans.* Venu, Kichaka. Bamboo.
,, ...	,, arundo	Chivari.
,, ...	,, balena	Cháki.
,, ...	Andropogon polystachyus.	Gondal. Elphinstone Point, Mahableshwar.
,, ...	,, muricatus ...	Wala, Khaskhas. Khuskhus grass.
,, ...	,, Sp. ? ...	A grass, with the smell of turpentine, near the Neral Station.
,, ...	Anthistiria cymbaria	
,, ...	Psilostachys filiformis.....	
,, ...	Ischæmum conjugatum ..	
,, ...	Bathratherum molle	
,, ...	Pollinia eriopoda	At Panchgani. Used for paper-making.
93 Cyperaceæ	Carex indica	Indian Rush.
,, ...	Fimbristylis æstivalis.....	
94 Aroideæ	Cryptocoryne Roxburghii..	
,, ...	Arisæma Murrayii	Sámpacha 'khánda, *i.e.* "snake-root." Cobra Lily.
,, ...	Amorphophallus campanulatus.	Suran.
,, ...	Remusatia vivipara.....	Rokh-álu. Wild Caladium.
95 Lemnaceæ.....	Lemna trisulca	Duck-weed.
,, ...	,, globosa	
	DIVISION B.—CELLULARES.—(*Plants with cellular tissue only*).	
	CLASS I.—FOLIACRÆ.—(*Leafy plants*).	
96 Filices (Ferns).....	Polybotrya appendiculata.	Only one specimen of this fern is known to have been found at Matheran. It has for many years been in the garden at "Underwood."
,, ...	Acrostichum variabile, *Syn.* Gymnopteris variabilis, *var.* lanceolata. *Herb. Co.*	
,, ...	,, virens. *Syn.* Pæcilopteris terminaris, and Gymnopteris subcrenata.	Rooting fern. Once plentiful on several favonrite sites at Matheran. Now almost exterminated by fern hunters.
,, ...	Asplenium planicaule. *Syn.* A. laciniatum.	
,, ...	,, radiatum, *Syn.* Actiniopteris radiata.	Palm fern. Khandála Ghát, on Mahableshwar road.
,, ...	,, fulcatum	
,, ...	,, lunulatum, *var.* trapeziforme.	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
96 Filices (*contd.*)	Pteris aquilina* *Herb. Co*	Netsa. Brake fern.
,, ...	,, quadriaurita, *Herb. Co.*	
,, ...	,, pellucida	
,, ...	Adiantum lunulatum, *Herb. Co.*	Hansraj, Rajhans, *i.e.*, "Goose foot" fern. Maiden-hair fern.
,, ...	,, capillus Veneris	On wet rocks, near Panchgani. (Cooke).
,, ...	Cheilanthes farinosa, *Herb. Co.*	Pátkuri. Silver fern.
,, ...	Osmunda regalis, *Herb. Co.*	Nadicha Múrúd. Below the lake, Mahableshwar, and at Lingmala.
,, ...	Lygodium pinnatifidum. *Syn.* L. flexuosum.	Hansráj-vel. Creeping fern.
,, ...	Sagenia coadunata. *Syn.* Aspidium cicutarium, *Herb. Co.*	Kájáryache Bashing. Indian Beech fern.
,, ...	Polypodium quercifolium, *Syn.* Drynaria quercifolia.	Kádik-pán. Indian Oak fern.
,, ...	Nephrodium molle, *Herb. Co.*	
,, ...	Pleopeltis membranacea. *Herb. Co.*	
,, ...	,, linearis, *Syn.* P. Wightiana, *Herb. Co.*	
,, ...	Lastrea filix mas, *var.*, cochleata *Herb. Co.*	
,, ...	,, filix mas, *var.* elongata, *Herb. Co.*	Male fern.
,, ...	Athyrium filix fœmina.. *var.* flabellulata, *Herb. Co.*	Lady fern.
97 Lycopodineæ (Club-mosses.)	Lycopodium imbricatum..	

CLASS II.—APHYLLÆ—(*Leafless plants.*)

98 Musci (Mosses) ...	Hypnum curratum.	
,, ...	,, squarrosum.	
,, ...	,, bryoides.	
,, ...	,, reflexum.	
99 Fungi	Agaricus campestris.	Alamben. Mushroom.
,, ...	Lycoperdon pratense	Bhuiphod. Puff ball.
,, ...	Dædalia gibbosa.....	Kerambi, Páranza.
,, ...	,, versicolor	
,, ...	Polyporus giganteus	
,, ...	Anisogonium esculentum..	Common on the Yenna, Mahableshwar.
,, ...	Loucostegia immersa	

* The brake fern grows in great profusion all over Mahableshwar. At Matheran it is now confined to a single site on the Garbet Ridge. No plants are now to be found on a site near little Chauk Point, where it grew a few years ago.

INDEX OF VERNACULAR NAMES.

(The references are to the figures in the first column of the Catalogue.)

NOTE ON THE FLORA OF MAHABLESHWAR AND MATHERAN.

By Theodore Cooke, LL.D. F.G.S.

An observant visitor to Matheran cannot fail to be struck with the way in which certain plants disappear as he ascends the hill from Narel. The Teak tree (*Tectona grandis*), the skeleton of whose dried leaves is so like lace-work, disappears before half the ascent is accomplished. The *Sterculia urens*, which looks as if its bark had been stripped off, and which is a very conspicuous tree along the ascent, also disappears, as well as the *Phyllanthus Emblica*, whose gooseberry-like fruit is used by the natives for pickling. On Matheran hill itself, many plants are met with which are not found on the plains below; and as we ascend to a still higher elevation and reach the table-land of Mahableshwar, 2,000 feet above that of Matheran, we find the effect of increased elevation in the gradual thinning out of certain plants, and the appearance of new ones. This is particularly noticeable on the ascent from the Koyna Valley, which is about 1,500 feet below the table-land of Mahableshwar; as the paths, by several of which the ascent may be accomplished, pass along well wooded slopes.

Ascending from the Koyna, the valuable Ain tree (*Terminalia tomentosa*) is very soon lost to view, and the only representative of the family (Combretaceæ) on the hill summit is the *Terminalia chebula*, which supplies the Myrobolans so largely exported for the tannin they contain.

In the same way the *Grewia microcos* and the *Wrightia tinctoria* disappear, the former very soon, while the latter is carried up very near to the plateau on the Ghát Road, near the small village of Metala. The *Casearia graveolens* may be found still higher up, but does not reach the summit, though it grows luxuriantly along the Ghát Road, not very far below Bombay Point, while the *Albizzia stipulata*, which is such a conspicuous tree at Matheran, with its dark, reddish-brown, papery pods, and its large, pinkish, brush-like flowers, ceases abruptly on the Fitzgerald Ghát Road, about 4 miles from Mahableshwar.

Looking through the list, so carefully and laboriously prepared by Mr. Justice Birdwood, I would make the following remarks:—

The *Reinwardtia trigyna*, which, in the introductory note to the Catalogue, is said to have been found truly wild on Varandha Ghát,

I have found wild in the Koyna Valley; at least I have found it growing luxuriantly in a dense jungle near the Koyna, in a locality far removed from any human habitations The *Brugmansia candida* is not indigenous. It is, I believe, a native of Peru, but it has found the climate and soil of Mahableshwar well suited to its development, as it grows most luxuriantly over the hill, and has been planted along the Fitzgerald Ghát Road. Its large, white, funnel-like flowers render it a very conspicuous object.

The *Clematis Wightiana* is not, as far as I know, found at Matheran, nor does it extend much below the summit of Mahableshwar. Its flowers are large and yellow, but as it flowers in January and February, when the hill is not much frequented, its blossoms are rarely seen. The plants in Orders 2 and 3 do not occur at Mahableshwar; the *Cocculus macrocarpus* does not quite reach the hill summit, though it may be found just below the Dhobi's Fall. *Polygala persicariæfolia* does not, I think, occur at Matheran, and indeed, is rare at Mahableshwar. It may be met with on the path leading from Lingmala Ravine towards the Waterfall. *Ancistrocladus Heyneanus*, though tolerably common at Matheran, does not reach Mahableshwar; nor do the plants of the Order GUTTIFERÆ, immediately preceding. Of the MALVACEÆ, neither *Hibiscus hirtus*, *Thespesia Lampas*, nor the *Bomax*, and of the STERCULIACEÆ, none of the plants catalogued are to be found at Mahableshwar. The *Triumfetta rhomboidea* is tolerably common, the *Elæocarpus oblongus* rare. There is a good tree of the latter in Lingmala garden, and a couple on the bank of the stream below the house. There is also a solitary tree in the compound of Prospect Cottage, at the corner of the Cross Road, just opposite the entrance gate of Temple Hall. Many of the leaves of this tree turn red, which render it a conspicuous object among the foliage of the woods, and the fringed petals of its flowers are very beautiful, the brownish-red calyx appearing through the interspaces between the petals. All the plants catalogued under the genus *Impatiens* are to be found at Mahableshwar, among them a very remarkable one, a yellow balsam (*I. Dalzellii*). *Evodia Roxburghiana* does not occur at Matheran, and is somewhat rare at Mahableshwar. One tree (a male) may be found on the Panchgani Road, a few yards beyond the turn to Kate's Point. There is another tree at the 4th culvert on the Fitzgerald Ghát Road, and a little further down the road, close to a culvert, are two trees, a male and female. A knowledge of some localities where a tolerably rare plant

may be found, will be useful to collectors. Neither of the Orders BURSERACEÆ nor MELIACEÆ are represented on Mahableshwar.

The *Mappia fœtida* is a very remarkable as well as common tree at Mahableshwar. I do not think it occurs at Matheran. The odour of its yellowish flowers, which appear in October, is most offensive, savouring of carrion Visitors to the hill are often puzzled by the strange odour, and unable to account for it. There is a tree in the Superintendent's compound, at the side nearest the Club, and several trees may be found close to the road, just below the Bund. *Zizyphus rugosa* is common both at Matheran and Mahableshwar, and its white berries are edible, though not very palatable. *Zizyphus xylopyrus* does not occur at Mahableshwar, while the *Scutia indica* is only found on the higher Ghâts, and does not descend to the level of Matheran. It is known at Mahableshwar as the "Wait-a-bit thorn," as when its hooked-thorns catch the clothes of a rambler through the woods, there is no going forward till the thorns are unhooked,—often a difficult process. It may be easily identified by its native name "Chimat."

Hemigyrosa canescens does not ascend to Mahableshwar, nor does *Schleichera trijuga*, but the Order (SAPINDACEÆ) is abundantly represented by the shrub *Allophylus Cobbe*, which, with its soft, trifolate leaves and long racemes of small, white flowers, is scattered everywhere over the hill top. The LEGUMINOSÆ are largely represented on both hills, but it is a remarkable fact that, while in Matheran, there are several *trees* belonging to the Order, there is not a single tree on Mahableshwar belonging to it. The *Crotolarias, Smithias, Desmodium, Phaseolus, Vigna, Atylosia, Cylista,* and *Flemingia* are common to both hills; but the only Acacia on the summit of Mahableshwar is *Acacia Intsia*.

Of the ROSACEÆ, the *Rubus lasiocarpus* or Mahableshwar Raspberry is very common and well-known. This plant is indigenous here and to the highest Ghâts to the Southward. *Rubus moluccanus* has been found at Mahableshwar, but it is very rare. It may be found in a ravine on the road to old Mahableshwar. I found it very abundantly on the high land (Newera Eliya) in Ceylon.

Of the RUBIACEÆ, neither *Adina* nor *Stephegyne* occur at Mahableshwar, the *Wendlandia notoniana* does not occur at Matheran; and I have only seen it in Mahableshwar, near the banks of the stream (Yenna) below Lingmala. *Psychotria truncata* is a rare plant, occurring as far as I know, at Mahableshwar, in a single

locality, which being far removed from habitations and in a dense jungle, it is difficult to describe. *Mussænda frondosa* does not ascend to Mahableshwar, though common at Matheran and in the Koyna Valley, where its velvety, orange flowers and curious, white, leaf-like bracts may be seen throughout the woods. Most of the COMPOSITÆ are common to both hills, but *Elephantopus scaber* does not ascend to Mahableshwar, though plentiful at Matheran and in the Koyna Valley, and the same may be said of *Cyathocline lyrata*, while I do not know that *Adenostemma viscosum* or *Adenoon indicum* have been found at Matheran, though common at the higher elevation. The commonest Composite at Mahableshwar, scattered all over the hill with the brake-fern, is *Conyza stricta*.

Of the CAMPANULACEÆ, the little *Wahlenbergia gracilis* does not grow at a low elevation. It is not found at Matheran and is very rare at Mahableshwar, the elevation being apparently insufficient, for at the high elevation of Newera Elliya, Ceylon, it grows very abundantly.

The *Sideroxylon tomentosum* which is verya bundant at Matheran, does not seem to thrive at Mahableshwar. It is nowhere found near the central portion of the hill top, and is confined to its edges. It is to be met with on the path-way up to Lodwick Point, and also occurs near Bombay Point. Neither *Bassia latifolia* nor *Mimusops Elengi* occur at Mahableshwar, while the Order EBENACEÆ does not possess a single representative.

Symplocos Beddomei is not met with at Matheran, but is tolerably plentiful at Mahableshwar. It flowers in the cold season; its blossoms have the odour of the hawthorn, and its berries, which ripen in May, are blue. There are one or two trees just opposite the gate of the Cemetery. The *Jasminium arborescens* is common to both hills, and its fragrant white flowers are seen in great profusion in April. The *Olea dioica*, which is very common at Matheran, is rarely met with in the Mahableshwar woods, while the *Ligustrum neilgherrense* is very common on the latter hill, and does not occur at all on the former. Its fragrant white flowers appear abundantly in October. Of the APOCYNACEÆ there is but one representative on the Mahableshwar hill, and that is a rare plant, the *Rauwolfia densiflora*. It may be found in the ravine below the Forest Officer's bungalow at Lingmala. Its white flowers appear in April. Of the ASCLEPIADS, the *Calotropis gigantea* does not ascend to the elevation of Mahableshwar. The most remarkable plant of the Order which occurs there is the

Gymnema sylvestre, which is an extensive climber, with small yellow flowers, appearing in the hot weather. The leaves of this plant, when chewed, possess the strange property of destroying for a time the taste for sugar, while exercising no effect on the taste for substances other than saccharine. If two or three leaves be chewed and the tongue and palate moistened with the juice, the result of taking a little sugar in the mouth is very curious. It appears just like so much sand, while salt or anything not saccharine tastes just as usual.

Of the LOGANIACEÆ, the *Buddleia asiatica* is the only plant of the Order at Mahableshwar. It is very rare. There is one plant at Lingmala, near the out-houses of the bungalow, and I have seen a plant on the Fitzgerald Ghát. Of the GENTIANS, the little purple *Exacum Lawii* is all over the Mahableshwar hill, in October, amongst the grass, but dies very soon after the rains cease. The *Swertia decussata* is found at Mahableshwar occasionally, but not common there. It is very abundant on the hill top above the Panchgani travellers' bungalow. An infusion of this plant is used by the natives as a febrifuge.

The Order BORAGINEÆ is represented on both hills by the genus *Paracaryum*.

The *Paracaryum cœlestinum* is known as the Mahableshwar "Forget-me-not." It is very abundant both here and at Matheran.

Two other *Paracaryums* are tolerably common at Mahableshwar, but as far as I know, do not occur at Matheran. The *P. malabaricum* is the more common, and may be found in large quantities at the Bund. *P. Lambertianum* may be found on the cliff, opposite the Dhobi's Waterfall, below General Barr's bungalow. Of the SOLANACEÆ, the *Solanum giganteum* is very abundant at Mahableshwar, but does not, as far as I recollect, occur at Matheran. It is to be found everywhere on the former hill, and its bunches of red berries are handsome.

The *Heterophragma Roxburghii*, which is very common at Matheran, does not seem to thrive at Mahableshwar. I only know of two trees at the latter place, and these are poor stunted specimens. One of them is just over the Yenna Waterfall, and the other a few yards beyond the 30th mile on the Satara Road.

Of the ACANTHACEÆ, *Thunbergia fragrans* may be found all along the Panchgani Ghát, and on the road from Panchgani to Mahableshwar, but, strange to say, it ceases at the 68th mile, half way

between these stations. It is somewhat remarkable that it does not extend to Mahableshwar itself, as it is very abundant at the high elevation of Newera Elliya, Ceylon. The term *fragrans* is a misnomer, as its flowers are destitute of fragrance.

Of the BARLERIAS, *B. Prionitis* with yellow flowers is very common on the road up to Matheran, but does not occur anywhere near Mahableshwar. *Barleria strigosa*, with large blue flowers, is common at Matheran, where it may be found in abundance below Ponsonby's Spring, but is only to be found on the slopes of Mahableshwar and not on the hill top. It may be seen in flower in the cold season, on the slope some way down below the Dhobi's Glen. *Ecbolium Linneanum*, which is very common at Matheran, and has green flowers, is not found at Mahableshwar; nor is the magnificent *Calacanthus Dalzelliana*, which grows in profusion on the wet rocks on the road up to Matheran, about a mile below the *Chauki*. Of the VERBENACEÆ, the *Callicarpa lanata* is common to both hills, the *Tectona grandis* does not reach even half way up the ascent to Matheran, and the *Premna coriacea* and *Gmelina arborea* do not grow at Mahableshwar. *Vitex negundo* will no doubt flourish on either hill; it has been largely planted along the Fitzgerald Ghát, and *Vitex leucoxylon* is to be found in the Koyna Valley. The *Clerodendron serratum* is not found on Matheran, nor on Mahableshwar hilltop, but it may be found about Lingmala Ravine and on the Panchgani Road; it also occurs on the slope below Bombay Point on the road to the Koyna. The most common of the LABIATÆ, both at Matheran and Mahableshwar, is *Leucas stelligera*. At Mahableshwar, another member of the genus occurs, *Leucas ciliata*, a larger and much less common plant than *L. stelligera*. *Dysophylla myosuroides* is not found at Matheran, but is common in Mahableshwar water-courses. It is abundant in the *nulla* near the Sassoon Point Tennis Court, just below where the road from the bazaar crosses the stream. *Micromeria Malcolmiana* is a small plant peculiar to Mahableshwar. It is found along the Yenna, below the Bund, and has a strong odour of peppermint.

The *Plantago major* is rare at Mahableshwar, and is not found at Matheran. It may be found on the banks of the Yenna River.

The *Lasiosiphon eriocephalus* is common to both hills, and is particularly abundant at Mahableshwar. The handsome climbing shrub *Elæagnus latifolia*, the under-sides of whose leaves have a sheen like silver, and whose pink coloured fruit is edible, is also com-

mon to both hills. Of the LORANTHUS family, I have not found either *L. involucratus* nor. *L. lageniferus* at Mahableshwar. The *Osyris arborea* is not found at Matheran, although growing at Khandalla, which is close by. It can be readily identified by its native name "Lotal." The Order EUPHORBIACEÆ is better represented at Matheran than at Mahableshwar. The Crotons are entirely absent from Mahableshwar; *Flüggea leucopyrus* ascends about half way up the hill from the Koyna and then ceases; while of the three trees, *Phyllanthus lanceolarius, Briedelia retusa* and *Macaranga Roxburghii*, the first only occurs in any quantity in Mahableshwar. Though the *Briedelia* does occur in one place, the top of the old Rotunda Ghát, below Bombay Point, it does not, as far as I know, occur anywhere else, and should therefore be hardly considered a Mahableshwar tree. The *Macaranga* does not grow at Mahableshwar at all, but the Bhoma (*Phyllanthus lanceolarius*) (*Syn. Glochidion lanceolarium*) is very abundant. *Homnoia riparia* is to be found in beds of streams at Mahableshwar, not at Matheran, and may be collected in the bed of the ravine below the Dhobi's Waterfall. Of the URTICACEÆ, *Gerardina heterophylla*, a formidable stinging nettle, is common to both hills, as are also the *Splitgerbera scabrella*, and the *Trema Wightii*. *Fleurya interrupta* is not found at Mahableshwar, nor is *Debrigasca longifolia*, a native of Matheran. *Ficus glomerata* (Umbar) is common on both hills, but none other of the genus *Ficus* is to be found on the hill top of Mahableshwar, except *Ficus caricaoides*, although *F. asperima*, *F. cordifolia* and *F. infectoria* may be met on the slopes. The *Artocarpus integrifolia* does not reach Mahableshwar; it is cultivated near villages in the Koyna Valley, and there is one tree at the village of Metala on the plateau below Bombay Point.

The *Salix tetrasperma* or Indian Willow does not grow at Matheran; it is abundant along the Yenna River and may be seen in flower in October.

With regard to the ORCHIDACEÆ, the handsomest one at Mahableshwar is the *Ærides Lindleyanum*, which does not occur at Matheran, and the most showy one at Matheran is *Ærides maculosum*, which is not found at Mahableshwar, though it is seen on the Panchgani Road. The *Dendrobium barbatulum* is common to both hills, and is in flower in March and April. *Dendrobium ramosissimum* is not found on the summit of either hill. It is very abundant in the Koyna Valley. *Dendrobium Macræi*, a curious looking orchid with many large pseudo bulbs, and a single leaf

growing out of the terminal one, is very rare at Mahableshwar, and is not to be found at Matheran. It is very abundant in the Koyna Valley, some of the old trees along the river being literally covered with this, *Dendrobium ramosissimum* and the bulbs of the *Cirrhopetalum fimbriatum*. A visit to the Koyna Valley will amply repay a plant-hunter. The ferns and orchids in some parts near the river are in the greatest profusion, and must be seen to be appreciated.

Of the two hills, Matheran and Mahableshwar, the former has the more varied flora, but several plants are found in Mahableshwar which do not exist at the lower elevation of Matheran. I have made a rough estimate, which is not correct to a dozen plants or so, that there are about 140 plants (excluding grasses) which occur at Matheran, and which do not occur at Mahableshwar, and that there are about 130 plants which are found at Mahableshwar, and not on Matheran, while there are perhaps 140 common to both hills.

I regret that I have not had longer time to devote to this short note, which has been written hurriedly, in order to be in time for the issue of the Journal in which Mr. Birdwood's Catalogue is to appear.

T. Cooke.

Mahableshwar, April 26th, 1887.

NOTES ON MAHABLESHWAR AND OTHER INDIAN ARROWROOT-YIELDING PLANTS.

By Dr. J. C. Lisboa.

There appeared, two years ago, in one of our local papers a short article in which it was sought to prove that there is no arrowroot plant indigenous to Mahableshwar, and a correspondent even attempted to show that a arrowroot prepared there is from *Maranta arundinacea*, carried from Rutnagherry to the hill and there cultivated. There is, however, no doubt, that the arrowroot prepared at Mahableshwar is from the tubers of a plant indigenous to that hill, first described by the late Mr. Graham, of the Bombay Civil Service, and as yet not found anywhere else so far as I know. The plant is *Curcuma caulina*, Nat. Ord. Scitamineaæ, Grah. Cat. Bomb. Pl. It is very common at Mahableshwar, where it is known to the natives

as Chowar. It may be described thus:—Root size of an orange, sometimes larger, with large oblong tubers, white inside, pendulous from the fibers. Radical leaves almost opposite, sheathing, short-petioled, oblong lanceolate, 12-20 by 3-4 in., upper leaves alternate frequently tinged with a beautiful red; scape central leafy, 3 feet high. Bracts green, calyx white, and corolla yellow.

It is from the roots of this curcuma that the Chinese ticket-of-leave men and a native of Goa, Mr. DeCosta, for many years used to manufacture arrowroot and sell it to the Commissariat and in the bazaars of Bombay. Dr. McConaghy says that, in 1878, a European prepared a few hundred pounds of it and sent samples to be tried by Messrs. Treacher and Co., Phillips and Co., and Kemp and Co. Its colour and taste were pronounced good, but it was found to be deficient in nutritive properties. That it is inferior to West-Indian arrowroot may be gathered from its market value, 5 to 6 lbs. to the rupee. During the famine of 1877, it was recommended to the suffering poor, but they never used it except in extreme scarcity.

The process of preparing arrowroot at Mahableshwar is simple. The root (of which a cooly will gather four or five large basketsful a day, for as many annas) is scraped, washed and rubbed to pulp on a grater, as mortars are found to crush the globules. The pulp is then washed with cold water, and the fecula allowed about ten or twelve hours to settle; the supernatant fluid is then decanted, the sediment stirred with the addition of fresh water and again allowed to settle. The whole process is repeated above twelve times, till the dark scum and the muddiness of the washings slowly disappear and the sediment is pure white, when it is allowed to harden into a cake, which is afterwards reduced to powder. A basketful of roots yields 3—4lbs. of pure arrowroot. *Curcuma caulina* flowers at about the end of September. I had planted in pots during the last monsoon tubers which I had brought from Mahableshwar, and with which I intended to illustrate my paper, which was meant to be read at the last October meeting. Having, however, been informed by the Honorary Secretary that the Society had resolved to hold, as it did, a fruit exhibition that month, I left Bombay soon after, and my plants had withered when I returned in the early part of December.

The arrowroot, a specimen of which I have exhibited though made in a rough manner, is white, and like other kinds of arrowroot insipid and inodorous. Examined under the microscope in a drop

of water, it is found to consist of numerous granules of various sizes, somewhat resembling those of *maranta* and *tickar*. They may be described as flat, somewhat irregular broadly ovoid bodies, round at the larger end, and narrow, almost drawn to a point, at the other, with a beautiful stratification, consisting of fine concentric lines around the hilum, which is visible towards the narrow end. To ascertain the proportion of nutriment principles of this arrowroot, a thorough analysis by a competent chemist is a desideratum. So far as my enquiries go, no such analysis has been made.

I am led to believe that arrowroot was obtained by a rough process by the hill men, long before the Chinese ticket-of-leave men manufactured it; and is still obtained by the inhabitants of the hill from the plant, which grows all over. It is now being manufactured at Gutad, about 3 miles from Frere Hall, and sold chiefly to natives, hence it cannot be of a very inferior kind, as stated by Dr. McConaghy. I shall now proceed to describe other Indian plants which yield various kinds of arrowroot. The best arrowroot is that which is prepared from the rhizome of *Maranta arundinacea*, Rosc. Scitam, tab. 25, a herbaceous plant, native of the tropical parts of America, and of the West India Islands. A variety of it, named *M. Indica* Tussac, Rosc. Scitam tab. 26, occurs in Bengal, Java and the Philippines, considered by Grisebach in his Flora of the British West-Indian Islands to be a species distinct from *M. arundinacea*. It is said that the arrowroot cultivated at first in Brazil, was from the rhizomes carried thither from India by the Portuguese.

The chief kinds of arrowroot, the produce of *Maranta*, are from Bermuda, Natal, St. Vincent, Jamaica and other West India Islands, Brazil and the East Indies. The latter is prepared from the tuber of *M. Indica* above mentioned, and sold pure or mixed with *Tickar* Arrowroot, presently to be mentioned. *Maranta arundinancea* is extensively cultivated at Dapoli in Rutnagherry, by Mr. Narayen Ramchandra Gupte. The Commissariat Department lately gave him the contract for 1886-87 for the supply of arrowroot to the several military stations in the Bombay Presidency. The total amount required at these stations in 1886-87 was about 5,000lbs. Mr. Gupte will have to supply this quantity of arrowroot at the rate of 4¼ annas per pound. It may be stated here that this arrowroot on examination, both microscopic and chemical, proves to be fully equal to the Bermuda arrowroot. It is also cultivated

by Mr. Woodrow, of the Poona College of Science; the produce is stated to be at the rate of 9 tons of fresh root per acre. When manufactured by unskilled hands this gives 2,822·4lbs., or 14 per cent. of pure arrowroot per acre. One of the agricultural students, Mr. R. S. Joshi, has lately invented a wooden machine which reduces the cost of preparing arrowroot by almost 8 per cent. The machine is still capable of great improvement, but its chief merit is that any village carpenter can make it.

Arrowroot of all kinds is a favourite article of diet among the natives, especially for children. The milk-men in Bombay use it to thicken milk which has been watered.—Dymock. *Curcuma angustifolia.* Roxb. *Tavakhir?* (Bomb.) *Tickar* (Hind.)— This is an annual plant, springing up at the beginning of the rains. Bulbs with oblong tubers hanging from the fibres. Leaves narrow, lanceolate, petioled, striated, with fine longitudinal lines, from one to two-and-a-half feet long; petioles, 6-10 inch long; spike radical, 4-6 inch long; crowned with a coma of purple bracts; flowers yellow, large, expanding in the morning and fading at sunset.

It grows wild in various parts of India, Travancore, Nagpore, &c. and in the Bombay Presidency at Ramghat. This species is said to yield portion of what is called Travancore arrowroot. There is no doubt that Curcuma arrowroot (known in Bombay as *Tavakhir, tickar* in the other presidencies, and to Europeans as East Indian arrowroot) is manufactured in Southern India especially in Cochin, Travancore and Kanara, but in a very rude manner, the granules much resembling those of *Maranta arundinacea*; in fact what is called tickar arrowroot is often the produce of the latter plant, or curcuma starch mixed with that of cassava or tapioca plant, the manhihot being much cultivated at Travancore. Malabar arrowroot fetches from Rs. 3 to Rs. 4 per quarter cwt. in Bombay. Drury (useful plants of India, p. 176) says:—"An excellent kind of arrowroot is prepared from the tuber of this species (*C. angustifolia*), especially in Travancore, where the plant grows in great abundance." This is a favourite article of diet among the natives. The flour, when finely powdered and boiled in milk, is an excellent diet for sick people or children. It is also much used for cakes, puddings, &c. though considered by some to produce constipation. In a commercial point of view the East Indian arrowroot is below the West Indian starch, though similar in its qualities and uses. The exports of arrowroot from Travancore average about 250 candies annually."

It appears that in 1869-70, 3272 cwts., valued at Rs. 14,152 were exported from Madras. Drs. Roxburgh and O'Shaughnessy state that *C. rubescens*, Roxb. Rosc. Scitam tab. 107, which grows in Bengal and is there named *tickar* also yields nutritious fecula. Every part, particularly the root, has a strong but pleasant aromatic odour when bruised; but its chief use is for the preparation of tickar, a fine fecula like arrowroot. *C. leucorrhiza*, Roxb. Rosc. Scitam tab. 102, also named *tickar*, is common in Behar; its horizontal tubers, long and straight, are of a very pale yellow colour; they also yield an abundance of fine nutritious fecula used by the people of Behar and Bhagalpore. Dr. Royle says:—"The pendulous tubers of *Curcuma rubescens*, *C. leucorrhiza* and *C. angustifolia* yield a very beautiful fecula or starch, which forms an excellent substitute for the West Indian arrowroot, *Maranta arundinacea*. It is sold in the bazaars of Benares, Chittagong, and Travancore, and eaten by the natives. A very excellent kind called *tickar* is also made at Patna and Bagilpore from the tubers of *Batatas* (*Ipomœa*) *edulis*."

The mode of preparing arrowroot at Travancore is as follows:—"The tubers are first scraped on a rough stick, generally part of the stem of the common rattan or any plant with rough prickles to serve the same purpose. Thus pulverised, the flour is thrown into a chatty of water, where it is kept for about two hours, all impurities being carefully removed from the surface. It is then taken out and again put into fresh water, and so on for the space of four or five days. The flour is ascertained to have lost its bitter taste, when a yellowish tinge is communicated to the water, the whole being stirred up, again strained through a piece of coarse cloth and put in the sun to dry. It is then ready for use."—Drury. The process adopted at Behar and Bhagalpore is as follows:—The root of *C. leucorrhiza* is dug up and rubbed on a stone or beaten in a mortar, and afterwards rubbed in water with the hand and strained through a cloth; the fecula having subsided, the water is poured off and the *tickar* dried for use.—Roxb.

C. pseudo-montana, Grah. Cat. Bomb. Pl. *Sinderwani*; *sinderbu*; *sindewan*; *hellewnda*. Bulb oblong, with round, small, potato-like tubers, hanging from the fibres. Leaves, including the petiole 2-3 feet long, narrow at both ends, 6-19 inch broad in the middle, quite green. Coma of a beautiful dark rose colour, waved. Flowers yellow, appear in September.

This plant, which was first described by Mr. J. Graham of the Bombay Civil Service, is common in the Konkan, Matheran, &c., where it appears at the beginning of the rainy season. The tubers, which are perfectly white inside, are boiled and eaten by the people during seasons of scarcity. Perhaps, this plant too, yields a part of East Indian arrowroot; for it is stated that in former times, it was manufactured at Ratnagherry from its tubers. (See specimens on the table prepared in Ratnagherry and North-West provinces.) All the plants described above belong to the Nat. Ord. Scitamineæ.

Arisæma tortuosum, var. *helleborifolium*, Schott Syn. Ar. 29; Prodr. 36; Blume in Rumphia 1-105. *Sap Kanda* (Khandala name). This belongs to the Nat. Ord. Aroideæ and is met with at Matheran, Khandala, and other Konkan hills, as well as in the Himalayas, at Simla, Nepal, Sikkim and Mussooree. In the observations appended to the plate 5931 in Curtis' Bot. Mag., Sir J. D. Hooker says that "the tuberous roots of this and allied species of *Arisæma* are used for food in times of scarcity by the Lipchas of Sikkim; they are prepared by burying them in masses in the ground, until acetous fermentation sets in, when they are dug up, washed and cooked. By this means the poisonous properties of the roots are in part destroyed, but not altogether, and violent illness often follows a hearty meal of 'tong' as this food is called. The nutritious starch, with which these tubers are filled, might be easily separated by grating and washing and an aliment as good as Portland island arrowroot (the starch of *Arum maculatum*) be thus procured in quantities." Though the tuber of this aroid is utilized as food by the Lipchas of Sikkim, it does not appear to be used as such on this side.

The plant described under the name *Arisæma curvatum* by Sir J. D. Hooker in Curtis' Bot. Mag. tab. 5931, above alluded to, is in the opinion of Engler, Araceæ, D. C. Monogr. Phaneg, *Arisæma tortuosum* var. *helleborifolium*, an opinion which is adopted here. Sir J. D. Hooker himself appears to have had doubts about the identity of the species for after stating that it grows in the forests of the Himalayas from Bhootan to Simla, Nepal and the Kassia mountains at elevations of 5,000 to 7,000ft. says—a "similar if not identical species inhabits the mountains of the Konkan in the Peninsula of India."

Arisæma curvatum which is well described in Rox, Fl. Ind. vol. III. p. 596, and figured in Wight's Icon. tab. 788 under the name

of *Arum curvatum* grows only at high elevations; and so far as it is known, on the Himalayas, Nepal, Naini-Tal and Kumaon; its lamina is pedatisect, leaflets 10-13, sessile, linear-lanceolate, 4-6 inch by ¼-¾ inch approximate, accuminate, entire.

A. helleborifolium is a common plant in the Konkan, first described by the late Dr. Stocks, of the Bombay Medical Service, as well as on the Himalaya mountains, Nepal, and Sikkim discovered by Lady Dalhousie, Wallich and others. I have found it also at Khandalla and Matheran, where it is known to the natives as *sap khanda*. Its lamina is pedate, 6-12 inch diameter and orbicular in outline: leaflets 13-23, 4-8 inch by 2-3½ inch acute, accuminate or caudate at the pit, bright green; central distant and petioled, lateral becoming gradually smaller, shortly petioled or almost sessile.

In my book (Useful Plants of the Bombay Presidency, "Bombay Gazetteer," Vol. XXV. chap. Famine Plants) I have stated the following:—"Almost all the species belonging to the order *Aroideæ* are more or less acrid and poisonous; some, like *Lagenandra toxicaria*, *Vatsunab* of the Marathas, *Typhonium tribolatum*, *Surei Kanda* of the Telingas, &c., are deadly poisons. They contain an acrid principle which appears to be destroyed by the application of heat or by mere drying of the aroids. During the late famine in Madras and Southern Maratha country, hundreds of people were seen to live upon tuberous roots and leaves of aroids known to be poisonous. It is believed that the washing, boiling and stewing process these herbs were subjected to prior to being eaten destroyed their deleterious principle, and thus the tubers, &c., became innocuous or rather wholesome food. The cultivation is also held to modify the poison both in the case of aroids as in that of cucumbers. The *Soorun* (*Amorphophalus campanulatus*) which is widely cultivated for the sake of its large root held to be a very nutritious vegetable and extensively consumed by all classes of people of this country, also contains a principle, slightly acrid; this is removed by steeping the sliced tuber in water and by boiling. Nevertheless, not long ago a paper was read at one of the meetings of the Grant College Medical Society in which a case of poisoning marked by severe inflammation of the fauces and throat was described." There is in North America a species of *Arisæma* named *A. atrorubens*, of which Dr. Lindley says:—"It is violently acrid and almost caustic; the rhizome when fresh is too powerful to render its internal exhibition safe. The acrid principle is extremely volatile, and easily driven off by heat

when the rhizome yields one-fourth of pure delicate amylaceous matter, resembling the finest arrowroot, very white, delicate and nutritive.

Tacca pinnatifida, Roxb. Nat. Ord. Taccacæ, known to the natives of the Deccan by the name of *khunda*.—It grows all over India and also in the Malayan Archipelago, the Molluccas and South Sea Islands, and is cultivated in the Mauritius. I found it very common at Damaun and the neighbouring villages of Guzerat. Its root is tuberous, as large as a large orange, often larger, round and smooth, intensely bitter when raw, it yields a great quantity of beautifully white starch, of which it is said the best flour for confectionery, puddings, &c., is made." Drury says:—"The fecula much resembles arrowroot and is very nutritive." "It possesses a considerable degree of acrimony," says Ainslie, " and requires frequent washing in cold water previous to being dressed. In Travancore, where the root grows to a large size and is called *Channay Kelimgoo* it is much eaten by the natives, who mix some agreeable acids with it to subdue its natural pungency." In the notes appended to *Tacca artocarpifolia* T. 6124, Curtis' Bot. Mag. Sir J. D. Hooker states:—'The tubers of *Tacca pinnatifida* afford the South sea Arrowroot, said to be the best of all in cases of dysentery, and its starch is a favourite article of diet in the shape of puddings and cake. In times of scarcity, the inhabitants of these islands live on the fleshy tubers of *tacca*."

ZOOLOGICAL NOTES.

HYBRID WOLF PRESENTED TO THE SOCIETY.—Mr. Frank Rose, the donor of this animal, writes concerning it :—

Apropos of Mr. Sterndale's "*Note on Reversion to Primitive types*," giving a case of cross-breeding between jackals and dogs, I have much pleasure in presenting the Society with a *Hybrid* wolf-whelp—a cross between a village dog and a wolf, age about 3 months, caught in the 69th mileage, Chickli-Dewalgaon, Rajah Road, (Buldana Districts, Berar). The mother with five other wolves (*Canis pallipes*) and a *hybrid* are in the vicinity of *Javul-Kheira*.

The whelp was captured on 12th January, under the following circumstances: While examining a quarry about a mile from the road, a dog was observed going leisurely towards a flock of sheep; the latter grazing and looking unconcernedly at their apparent protector! But, alas! after a few minutes, an

outcry from the shepherd was heard, when to our astonishment the carcass of a sheep was being triumphantly carried away by the wolves in fragments, the *Hybrid* "wolf dog," as he is called, acting as a pioneer (but without the dainty piece of mutton), heading the marauders. One of them made direct towards a bush, when the three whelps came out. Chase was given, and on seizing one it bit a man slightly, when it was soon despatched to its long home! The one now sent (1st February) also showed fight, and resisted his capture for a long time, but was soon coaxed, and secured; the third made its escape with its mother and her *confrères*. For the first three days (12 to 15th January) the pup seemed very unhappy, and sulky, but had a voracious appetite for raw meat. After a time he gradually became very tame, so much so that my children played with him. This may be considered rather an imprudent act, but he appeared so happy and contented in their arms, I concluded, that he had domestic blood in him like his noble grandfather, the village pariah! The whelp was under domestication for eighteen days.

From the same pack there were three *Hybrids*:—

No. 1—brought up by the special magistrate at Mahona—is now prowling about in that vicinity and Rajah-Dewalgaon, quite domesticated; she will not reside with her master or in one place; but goes roaming from one village to another in the vicinity, and does not associate with her parents. She has never been known to bite any one, but is said to be a renowned thief. I have always seen her escorted by an intrepid village cur, who seems to be quite delighted with her agreeable company, in having a charming wife of mixed parentage!

No. 2 was shot by a Mr. Burns of Berar, when capturing No. 3, early in 1886, at about the same place as I got mine.

No. 3 was quite a pet, but very mischievous with her thieving propensities. She frequently occupied a dark room during the day, and making her exit at nights, would steal clothes, hats, boots, &c., and deposit them in different bungalows. The poor thing was killed, wilfully I was told.

From the above facts, it is possible that within the next 25 years the wolves in this vicinity may in time become domesticated. The *first* Hybrid was known in 1885, I believe, and is the one now with the pack. Eminent Naturalists have decided that the anatomical structure of the wolf, its habits, and physical development are very closely allied to the dog; especially in its osteology, which does *not* at all differ. The only difference is in their oblique eyes. There can be no doubt that the dog and wolf will readily breed and their progeny prove fertile. The above will suffice as an instance in India. There is no gainsaying the fact, that they are mortal and irreconcilable foes, and poor doggie sometimes provides a dainty morsel to its supposed great grandparents; but yet they are known to follow domestic dogs in pursuit of smaller mammals. We are told that two species of the wolf, *Canis Lupus* and *C. latrans*—the latter known as the "*Coyote*" ("*Meestch chaggonish*") or "Prairie wolf"—are the *originators* of *all* the canine species? Then why could they not breed and be made tameable and just as affectionate as our domestic dogs—*Canis familiaris*.

If I remember rightly, it is on record that a lady in Italy had a very tame and affectionate wolf, which followed her like a spaniel. Business took the lady from

home for a few days, and on her return the wolf, through joy went up to her, put its paws on her shoulders, and immediately fell dead!

THE BUSH QUAIL (*Perdicula erythroryncha*).—The following letter about this bird has been received from Mr. W. Mahon Daly, of Yercand :—

It well known that the attachment of birds to their young is not exceeded by that of any other creatures.

The boldness and sagacity displayed the other day by a red-billed bush-quail (828 *Perdicula erythrorhyncha*) in the protection and defence of its brood, may not be uninteresting to your readers. A friend of mine caught in his hand a little one of this quail, and sitting silently under a bush watched for the mother. The chicken cried piteously for some few minutes, when, shortly the parent bird arrived, which seemed immediately to restore life to its frightened offspring. The bush quail repeatedly pecked at my friend's hand, and he in attempting to catch the bird took off a quantity of feathers. It came again and again, and seemed to peck at his hand beseechingly, rather than hurtfully, till at last it was caught a victim to maternal love. The mother having fairly won its little one was released, *and in a twinkling disappeared* with its "chick," and they were soon concealed in the long grass that this handsome bush-quail generally frequents.

These birds are generally met with in rocky ground with low scrub jungle, and nearly always in pairs, and not in large bevies as stated by Jerdon. An accurate observer has remarked that the natural timidity of birds is a great preservative to them. This quail however is most daring, for I have more than once seen it fly at a dog in defending its brood, and have often caught a bird off its nest, which contains generally six to eight eggs.

NOTE ON THE IRREGULAR BREEDING OF GRUS ANTIGONE, THE SARUS.

By Lieut. Edwin Barnes.

The normal breeding season of the Sarus is during the latter half of the monsoon, but that they frequently breed during the cold weather seems not to be generally known.

At page 6, "Game Birds of India," Mr. Hume gives the breeding season as above, but in a footnote, says:—"Occasionally, however, they certainly breed also in the spring." Quite recently, Mr. Chill wrote to me from near Delhi:—"Last month (April), my men brought me in a young Sarus, about twenty days old, so it must have been hatched about the end of *March*! It is a new thing to me to find the bird breeding in the spring."

On the 5th February last year (1885), while duck-shooting at Gangrar, about 60 miles from Neemuch, I found a nest containing two perfectly fresh eggs, and on the 30th March at Jeerun, about twelve miles from Neemuch, I found another pair, much incubated. This year (1886), on the 18th February, I obtained from a marsh, a few miles from Saugor, two more, very slightly incubated; these last eggs are perfectly white and spotless, and have a considerable amount of gloss, and my beaters assured me that this was the case with all Sarus's eggs in the Sangor District, but as is not unusual with native shikaries, they deviated from the truth, for the only two pairs of eggs that I obtained later in September, were fairly well marked.

A simple explanation of the cause of some few birds breeding in the spring might be that they are birds whose eggs have come to grief at the usual breeding season, and had in consequence laid again later on; but this theory is met by the fact, that eggs have been found, both by myself and others, in nests from which eggs had been taken two or three weeks previously, but it is not unlikely that they may be birds whose half-reared young have fallen victims to one of the many accidents to which they are liable. The young of the Sarus remain with their parents much longer than is usually the case with other birds.

The time at my disposal is very limited, and at most I can only get out for a few hours occasionally, and that three instances of this departure from the natural course should have fallen under my personal observation, seems to point to its being rather a common occurrence, but then, again, seeing that at this season of the year, the marshes and lakes frequented by these birds are almost daily shot over for snipe and ducks it does appear strange that such a prominent nest as that of the Sarus usually is, should escape notice, or it may be that the fact is so common that it fails to excite remark, although it appears to be unrecorded except in the note previously quoted.

COLLECTION OF BIRDS' EGGS.

PRESENTED TO THE SOCIETY BY MR. W. M. GIBBS.

No. of Specimens.	English Name.	Scientific Name.	Jerdon's No.
1	Indian King Vulture	Otogyps calvus	2
1	White-backed Vulture	Pseudogyps Bengalensis	5
2	Tawny Eagle	Aquila Vindhiana	29
2	Ring-tailed Sea Eagle	Haliaetus leucoryphus	42
18	Pariah Kite	Milvus govinda	56
7	Rock-horned Owl	Bubo Bengalensis	69
6	Spotted Owlet	Carine brama	76
3	Common Indian Bee-eater	Merops viridis	117
1	Common Indian Kingfisher	Alcedo Bengalensis	134
5	Rose-ringed Paroquet	Palaeornis torquatus	148
1	Rose-headed Paroquet	Palaeornis purpureus	149
1	Indian Koel	Endynamis honorata	214
3	Purple Honey-sucker	Cinnyris Asiatiaca	234
4	Bay-backed Shrike	Lanius vittatus	260
3	Common Drongo Shrike	Buchanga atra	278
2	Rusty-breasted Fly-catcher	Siphia Erythaca	322
1	Bengal Babbler	Malacocercus terricolor	432
4	Large Grey Babbler	Malacocercus Malcolmi	436
5	Striated Bush Babbler	Chatarrhæa caudata	438
9	Common Madras Bulbul	Pycnonotus hæmorrhous	462
3	Indian Oriole	Oriolus Kundoo	470
2	Magpie Robin	Copsychus Saularis	475
1	Franklin's Wren Warbler	Prinia gracilis	536
1	Malabar Wren Warbler	Prinia Hodgsoni	538
23	Common Wren Warbler	Drymoipus inornata	543
2	The Jungle Wren Warbler	Drymoipus sylvaticus	545
3	Pied Wagtail	Motacilla Madraspatensis	589
7	Indian Corby	Corvus macrorhynchus	660
1	Common Indian Crow	Corvus splendens	663

No. of Specimens.	English Name.	Scientific Name.	Jerdon's No.
1	Common Indian Magpie	Dendrocitta rufa	674
1	Common Myna	Acridotheris tristis	684
1	Bank Myna	Acridotheris ginginianus	685
7	Common Weaver-bird	Ploceus Philippinus	694
2	Plain Brown Munia	Amadina Malabarica	703
2	Blue Rock Pigeon	Columba intermedia	788
3	Little Brown Dove	Turtur Senegalensis	794
6	Common Ring Dove	Turtur risorius	796
4	Common Sand Grouse	Pterocles exustus	802
4	Common Peacock	Pavo Cristatus	803
2	Grey Partridge	Ortygornis pondiceriana	822
7	Jungle Bush Quail	Perdicula Asiatica	826
4	Black-breasted Bustard Quail	Turnix taigoor	832
10	Red-wattled Lapwing	Lobivanellus Indicus	855
3	Yellow-wattled Lapwing	Lobipluvia Malabarica	856
4	Sarus Crane	Grus antigone	863
3	Bronze-winged Jacana	Parra Indica	900
9	Pheasant-tailed Jacana	Hydrophasianus chirurgus	901
2	Purple Coot	Porphyrio poliocephalus	902
2	White-breasted Water Hen	Erythra phoenicura	907
1	White-necked Stork	Dissura episcopa	920
1	Large Egret	Herodias alba	925
1	Little Egret	Herodias garzetta	927
4	Cattle Egret	Bubulcus Coromandus	929
1	Pond Heron	Ardeola Grayii	930
7	Pelican Ibis	Tantalus leucocephalus	938
2	Spoonbill	Platalea leucorodia	939
4	Shell Ibis	Anastomus oscitans	940
8	White Ibis	Ibis melanocephala	941
1	Flamingo	Phoenicopterus antiquorum	944
2	Black-backed Goose	Sarcidiornis melanonotus	950
1	Large River Tern	Sterna seena	985
2	Lesser Cormorant	Phalacocorax carbo	1006
14	Indian Snake Bird	Plotus melanogaster	1008

All the above were taken in the Kaira District with the exception of the Flamingo (Phoenicopterus antiquorum) which came from the Persian Gulf.

BOOK NOTICE.

The book under notice * refers to work done ten years ago, but was only published in England late in the year before last. Mr. Hornaday was commissioned by Professor Henry A. Ward, the proprietor of a great Taxidermical Establishment at Rochester, in the State of New York, to travel for two years in the East in search of fish, flesh and fowl; but chiefly of the larger mammals and reptiles. He started for Europe early in 1876; and is probably the only traveller of this generation who has produced a really readable account of a trip from a great European or American port to Bombay. He landed at Londonderry, and began his adven-

* *Two Years in the Jungle*, the Experiences of a Hunter and Naturalist in India, Ceylon, the Malay Peninsula, and Borneo. By William T. Hornaday, Chief Taxidermist, U. S. National Museum; late Collector for Ward's Natural Science Establishment. London: Kegan Paul, Trench & Co. 1885.

tures among the giant mammals of the Old World by "skeletonizing four old donkeys" in the county Down; for which the finest pisanthry on a fruitful sod "came at him with longhandled spades" and "boycotted him in a cabin" till the siege was raised by H. M.'s Royal Irish Constabulary. The motives of his proceeding and of their resentment are obscure; unless we conceive that old donkeys are so rare in the State of New York, that a traveller can profitably spend money and time on their purchase and dissection; and that the patriots, on the other hand, considered the victims to be their own next-of-kin; and the slaughter to be good cause for a blood-feud. Anyhow Mr. Hornaday "came off with whole bones—mine I mean, not the donkey's," and upon the whole prefers Dyaks to Irishmen.

He got to Bombay after, as we have said, the only amusing trip thither of the last 20 years; and was disappointed with the contents of the Victoria Museum; but found the Crawford Markets a happy hunting ground; and arrived at the conclusion that there were "few marine animals in the neighbourhood of Bombay, except the fishes in the grand Market." Upon this head we feel justified in observing that Mr. Hornaday generalized from a very imperfect experience. He was a week in Bombay, and does not appear to have visited the neighbourhood of it at all.

His next halt was at Allahabad, whence he proceeded to Etawah and spent some time living in a boat on the Jumna and shooting gavials (*Gavialis gangeticus*), *i.e.* long-snouted fishing crocodiles there abundant, but not found in our local waters.

Our author had one great advantage over the ordinary sportsman, namely, that almost every creature that he saw was capable of being turned into the almighty dollar at Rochester, N. Y.; and he was therefore armed against the scorn with which old shikaris treat the griffin who has killed something that is "not shikar." If he didn't find a gavial any morning, he found a jackal, or a vulture, or a stork; anatomised him "straight away" and enjoyed immensely a trip which would probably have rather bored the sportsman of Philistia. He points out very well the peculiar charm of crocodile-shooting, which is that above all other forms of the chase it requires the use of straight powder; often under considerable difficulties and at long ranges. And, like a good many other people, he did *not* catch a river porpoise (*Platanista*) but he says he will do so yet.

After this he went out "into districts" with an Executive Engineer and his wife, and fell into the usual delusion of the globe trotter, that the life of a Mofussilite family under canvas is "a continuous picnic," which is of course based upon the not very recondite fact that his host and hostess did all they could to make it so to *him*. Picnics of this sort, however, are apt to pall a little upon the soul of him with whom they have been "continuous" for 20 years or so; and who has had to make them pleasant *for himself* in despite of the powers that sit in cool places.

Our picknickers, at any rate, introduced Mr. Hornaday to the black-buck, nilgai, and gazelle, and appear to have informed him that this last was "not found south of the Godavari," which shows that the Britisher can occasionally "ring in fun" even upon Professor Ward's young men. The Indian Gazelle (*G. Bennetti*) was to be seen every day near Poona, by any one with eyes in his head, at the time he wrote this, and is scattered all over the Deccan Districts and others, far southward, though nowhere so abundant as in parts of Khandesh and Gujarat.

The finest gazelle horns the present writer ever saw were reported by the owner to have come from near Kolhapur, and to be 16 inches long, and *looked it*; but were hung too high to be measured.

To return to our traveller. He went from Etawah to Calcutta without any adventure worth noting; except perhaps the pangs he seems to have felt at seeing seven score monkeys fed in Benares, whereof he might not skin so much as one: and a disappointment in the Taj Mahal of Agra. He got to Madras in the middle of the famine, and moralised quaintly upon the Relief operations. "The natives look upon the British occupancy of their country as a punishment inflicted upon them by the gods for past misdeeds * * * * *They had better pray for their gods to punish them some more in that way.*" He further approved highly of the Madras Museum, and especially of its stuffed fishes.

Madras, however, was no place for him, and he went, naturally enough, to the Nilgiris, where he found that "every prospect pleases, and only man is vile." He did, however, get introduced to the sambar, bison, and elephant at home, and thought that the last was "the most stupid animal he ever tried to approach." This opinion, based upon the conduct of a single herd, he afterwards saw reason to modify considerably, and eventually came to the conclusion, that the elephant is much cleverer than the dog. He also was thanked by a Hindoo for a kindness, and doubts whether "any Anglo-Indian will believe it really occurred;" from which it will be perceived that Mr Hornaday's acquaintance with the featherless bipeds of India was limited to specimens hardly worth preserving as types. Further on he "is not ashamed to say that he *hates* the gentle Hindu."

It is to be regretted that a writer evidently intelligent and energetic should permit himself such a license of expression about a set of people with whom he could not converse even in Hindustani; on the strength of his acquaintance with a few low-caste servants and hunters, who, upon the whole, seem to have served him fairly well.

After the Nilgiris, Mr. Hornaday shot in the Anamalai Hills with great success: but his shooting was much like that of the "Old Forest Ranger," the "Old Shikari" (whom he suspects, as some other people do, of having had a very slippery foot-rule) and other great Nimrods. It is well described, but there is nothing new about the story to most of us; and it is rather matter for the *Field* than for this Journal. At the end of his account of it is a short treatise upon elephants, worth reading by any one who has never read a treatise upon elephants before. The most noticeable item in it is his insistance, for cause shown, upon the specific distinction of the Ceylon elephant.

From Madras he went to Ceylon, and landed sick with fever at Colombo; whereupon the Colombiads took him to be drunk. As, by his account, part of the accommodation of a Hotel in Colombo was a special room for gentlemen past taking themselves home, perhaps they were not much shocked.

However he found a doctor who cured him of the fever by a prescription which, for the benefit of all future patients, Mr. Hornaday records. He thinks, however, that it isn't all right; and we can affirm without fear of the faculty that any gentleman who brewed it according either to the text or to the explanatory note, would be in possession of a cure for all earthly ills.

It provides for a quarter of an ounce of strychnine per diem, for 4 days running.

But it cured Mr. Hornaday as easy as he would have cured a tiger-skin.

Colombo, according to our author, is the most beautiful city of the tropics. The only ugly thing about it is the name of an Esplanade. It furnished him with lots of fish and marine invertebrata, and with the curious fact that the *Echini* of Ceylon and Malayana lose their spines unless soaked in spirits before drying, whereas those of the Red Sea, the Mediterranean, and the West Indies can be dried without soaking, and the spines will not fall off. Most or all of our Bombay *Echini* are certainly the better for the spirit-bath. On the British coasts some can dispense with it.

The Government of Ceylon charged Mr. Hornaday spirit duty on his methylated spirits, and would not refund it, which seems hard. At least it may be confidently affirmed that no Indian Custom House would charge on such spirits. The other side of the story is not, however, before us.

Here comes in a digression upon the immunity which Naturalists enjoy, it appears, in the enlightened republic of Venezuela; where their outfit and supplies are free of duty, including arms, rum, and salt. This is a very good idea, and we think that this Society might very well address the Government of India with a view to a similar exemption. Doubtless other learned bodies in the other Presidencies would support us; and natural science will become popular—except with the Commissioner of Customs. By this time, doubtless, every living human being in Venezuela is a Naturalist—more or less.

Mr. Hornaday travelled pretty nearly all round Ceylon, halting at various uncomfortable places to collect marine animals, chiefly.

He rejoiced greatly over a specimen of *Rhamphobatis* (*Rhynchobatus*) *ancylostomus*, the rare "*Mivil*" of our coast, called in those seas "*Cululava*" and "*Manoluea*"; and in preparing it he found 130 spines of small sting-rays sticking about its chops; each representing, as he concludes with great probability, the last futile remonstrance of the sting-ray against being devoured by its big cousin. He also got a monkey shark (*Stegostoma tigrinum* he says) over 6 feet long, but the description and plate seem to indicate some other fish; possibly a new species: as any one may see by comparing them with Dr. Day's in our Library, and with our specimens in spirits. *Stegostoma* is not so rare a fish as Mr. Hornaday seems to have thought. After that he got *Urogymnus Asperimus*, a fine porcupinish ray, of whose skin some Malayan savage men make shields occasionally, corals, birds, and crocodiles. These last were of our broad-snouted species, the "Mugger," which, in Ceylon, Mr. Hornaday calls *Crocodilus palustris*, as we do (following Gunther), though in India he calls it *C. bombifrons*. He remarks on its power of standing with the belly clear of the ground, walking, and even running; and this he observed in specimens eight feet long. The present writer has seen it in half-grown and young specimens. It is certainly rare amongst the *Crocodilia*, which is probably the meaning of our author when he says that he "never observed it in other *saurians*." This taken literally, is nonsense; and in contradiction with the context.

He shot 44 flying foxes with five shots; and skinned them; and didn't die of it, and he got a *Manis pentadactylus*; or as we sometimes call it a "scaly-

ant-eater" (*Marathice* "*Kaul-manjar*") and was told by the Sinhalese that this creature (of which he gives a beautiful vignette) curls himself around the elephant s trunk and suffocates him!

He went to Point de Galle, and found a very rare animal in that port, *viz*., an honest "Moor-man," who sold him real stones at reasonable rates, under the name of Muhammad "Ossen" (presumably "Hasan" or "Husain")

And then he shook the dust off his feet against the Government of Ceylon and sailed to Singapore which he calls "the Hub of the Far East."

In Singapore he found little to collect, having come at the wrong season, though, on a subsequent visit the Malays brought him marine miscellanea "by the boat-load." Amongst many specimens of *Homo sapiens* he found three Americans, the Consul and his two daughters: and thinks it worth while to record that the first was "loyal to the back bone, and devoted heart and soul to the interests of the Government he represents," which one would hope is hardly a rare character amongst Consuls; although the maintenance of a Consul to look after his own two daughters in a port where no other resident specimen of the nation was to be found, seems to be a diplomatic luxury on the part of the "Government he represents."

However, two more arrived during Mr. Hornaday's stay and satisfied him "in spite of the Scotch blood" of one of them.

He found that the Europeans drank more brandy and soda than was good for them, which is a common complaint with him, as with other temperate men who make it a custom to frequent fourth-rate hotels in seaport towns. "Of the social life of Singapore he knew nothing," but "from what he was told" thanked God for America, as a better place to know something of society in.

Having contemned what he "knew nothing of" to his heart's content, and visited the private Menagerie of the famous Mr. Whampoa; Mr. Hornaday started for Selangore, and wisely made friends with the Superintendent of Police, by whose advice he went to a place called Jerom, on a "night of the kind especially made for boating" (a good phrase) and there he proceeded to catch *Crocodilus porosus*, which he calls the sea-crocodile (also a good phrase), although he only once saw the species out at sea, as it seems to be rather an estuarine reptile. He shot a few; but his best specimens were caught with the "Alir," an ingenious Malayan "trimmer" which he describes and figures. He saw monkeys (*Macacus cynomolgus*) picking up small crustacea at low water; and captured a *Hydrosaurus* similarly employed. Also he had a great hunt in the mud after a jumping fish (*Periopthalmus schlosserii*) which any one who pleases may reproduce in Bombay Harbour if he will be content with our allied "mud-fish" (*Boleopthalmus Boddaarti*). Centipedes swarmed in his bed and clothes, and he didn't care. Moreover he cured a man of the stab of a sting-ray, which had quite perforated the hand, with tincture of arnica, "divine stuff," as he calls it. After this he returned to Klang, the Capital of Selangore; and started thence for Kwala Lumpor, the centre of the tin mines of that district. Here the most wonderful thing he found was "Jules Mumm's best at 60 cents a quart" (=Half a crown a bottle); but a little ahead of this he discovered the "Durian" (*Durio zibethinus*) and appears to have been the first white man who ever fell in love with that remarkable fruit (a cousin of our jack-fruit) at

first sight. Durians are nearly as large as jacks, and sold at this period, 17 for a dollar, and our hero invested a dollar in them then and there.

The durian groves were tended by Malays, who lived, for fear of wild beasts, in platforms on the trees, such as we should call "Machháns." Further on Mr. Hornaday met with "Junglies" called Jacoons; who had never housed in any other way; and whom he supposes to be descended from emigrant Bornean Dyaks. These primitive folk live (or lived then) on game and forest produce alone, specially bats swarming in certain caves, obtained by the simple process of knocking them down with sticks, which the present writer has found pretty efficacious at Ajanta in the like case. "Fortunately they knew the value of money" and became shikaris to our author and his comrades: and assisted at the slaying of an elephant. Here Mr. Hornaday obtained a dead python; and here he digresses to observe that throughout the Indies he found serpents as scarce "as in *Ireland*;" which "was disgusting, after all the big snake stories I had heard." The only snake he saw in Selangore was "a vicious little viperine affair, which I killed with a prayer-book in Captain D.'s drawing-room, while kneeling at prayers one Sunday evening."

From Singapore Mr. Hornaday was bound for Borneo; but the Singaporeans couldn't or wouldn't tell him much about it. However he fell in with one of the District Officers of Raja Brooke, and accompanied him to Saráwak, as we call it: but on the spot people call it Kuching, which is to say "a cat."

He admired the Raja's government, and proceeded to collect specimens, and get ready for a trip into the interior. The Raja pays rewards for the slaughter of crocodiles (*C. porosus*), on a graduated scale, by the linear foot, and Mr. Hornaday gives the statistics of 1878 for two rivers. During that year 266 crocodiles were brought in to be measured and paid for. One was 13 feet 10 inches long, two others exceeded 13 feet, two more 12 feet, ten were over 11 feet, and 18 over 10 feet. The majority were between 7 and 9 feet long. The application of a foot-rule has a singularly dwarfing effect upon the dimensions of reptiles. Besides the estuarine *crocodilus porosus*, Borneo has a rare gavial (*Tomistoma Schlegelii*) which Mr. Hornaday did not see in the flesh, but he got a skull 3 feet 3 inches long.

The District Officers gave him a passage to the Sadong River, and quarters in the "Government House," or, as we should call it, the "District Bungalow," from which he hunted for several days, but got nothing to speak of: so acting on information obtained from the Dyaks of the Simujáu he started up that river in his own boat, in company with a Government writer, Mr. Eng Quee. Here he made acquaintance with a Dyak "long-house," a whole village under one roof, and over one floor (the whole supported on piles), and at the first attempt he shot three ourang-outangs in one day.

This shikar was accomplished in a canoe, paddling in a forest flooded with several feet of water, yet dense and lofty enough to allow the ourang-outangs to travel from tree to tree at a great height from the ground. As ourangs can't swim, they have to stick to the tree-tops.

From August to December he lived amongst the Dyaks; occasionally meeting with the Raja's officers, or accompanying them on their tours. Then he packed up and went home. This last part of the book, dealing with Borneo, its beasts

and its people, is very much the best of it. The author really did make acquaintance with the country and people, and his observations about both are valuable, very unlike his hasty generalizations on Indian matters. He killed gibbons and ourang-outangs and "proboscis monkeys," and collected more strange creatures than we have space to enumerate.

Altogether his book is better worth reading than any recent book on the Far East and the part of it dealing with his own adventnres and special subject is as good as it can be; the "*obiter dicta*," as we have already remarked, are frequently hasty, and, we regret to add, occasionally in the very worst taste.

The illustrations are of very various degrees of merit. Those by the author's own hand would make Mr. Ruskin stare and gasp, but have a certain quaint verisimilitude. Others, borrowed (always with acknowledgment) or executed for the work by professional artists are of high quality.

PROCEEDINGS.

THE usual Monthly Meeting of the Society took place on Monday, the 10th January 1887.

Dr. D. Macdonald presided.

The following new members were elected:—Mr. W. W. Barr, Rev. E. S. Hall, Mr. John Wallace, Major T. T. Leonard, Mr. W. F. Melvin.

The Honorary Secretary, Mr. Phipson, reported receipts of contributions to the Society's Collection, amongst which were two Birds of Paradise from H. H. The Maharaja Holkar; Lizards and Snakes from Mr. F. Gleadow; a large collection of Fishes &c., from the Red Sea and Perim from Capt. Aves; a colleotion of Butterflies from Col. C. Swinhoe; and one of plants from Mr. James Murray.

To the Library were contributed:—Magazine of Natural History, Vol. 18, Nos. 107-108, from Mr. H. Littledale; Two Years in the Jungle (Hornaday), from Lieut. W. A. Connop, R. N.; Useful Plants of the Bombay Presidency (Dr. Lisboa), from the Author; Journal of Comparative Medicine and Anatomy, Vol. I.; Journal of the Brovelle Society of Natural History, Nos. 1 and 2 Proceedings of the Linnæan Society of N. S. Wales, Vol. I., Part 3.

Mr. Murray, late Curator of the Kurrachee Museum, exhibited a collection of Marine Algæ consisting of 212 species, from the Coast of Sind, and described the same. Dr. Kirtikar read a paper on Marine Algæ collected by the Hon'ble Mr. Justice Birdwood on the Ratnagiri Coast. Mr. Sterndale exhibited a fine head from his own collection of *Cervus maral*, the Persian stag, and described the differences between it and the Cashmere stag.

THE usual Monthly Meeting of the Society took place on Monday, 7th February 1887.

Dr. D. Macdonald presided.

The following new members were elected:—Lieut. W. A. Connop, R.N., Mr. H. T. Silcock, C.S., Mr. Louis Bergl, Col. G. Merewether, R.E., Dr. J. H. Irving.

Mr. R. A. Sterndale was unanimously elected Vice-President in the place of Dr. Maconachie, who had resigned.

Mr. H. M. Phipson, the Honorary Secretary, then reported and acknowledged contributions to the Society's collections and library.

Mr. R. Gilbert exhibited a broken piece of a Sambur's horn, measuring 44¾ inches, which he had shot off an animal in Asirgarh. The fracture had taken place above the brow antler, so that the horn must have been of extraordinary measurement.

Colonel Charles Swinhoe then read a most interesting paper on "Mimicry in Butterflies for protection," illustrated by many beautiful examples from his private collection. This paper will appear in the next number of the Society's Journal.

The March Meeting of the Society was held on Monday, the 7th, when upwards of seventy members were present.

Mr. R. A. Sterndale presided.

The following new members were elected :—Sir M. Melvill, K.C.I.E., Mr. T. Walker, Mr. N. F. Surveyor, Mr. Pherozeshah Merwanjee Jeejeebhoy.

Mr. Phipson, the Honorary Secretary, acknowledged various contributions to the Society during the past month, and also the following books for the Library :—

Bulletins of the California Academy of Science, Vol. II., No. 5; Record of the Geological Survey of India, Vol. XX.; Verhandhengen des Zoologisch Botanischen; Gesellschaft in Wien XXXVI., Band III.-IV., Quartal; Journal of Comparative Medicine and Surgery, Vol. II., No. 1; Life of Frank Buckland (Bompas), from Mr. E. C. K. Ollivant, C. S.; Sport in India (Aberigh Mackay), from Mr. J. A. Murray; Annals and Magazine, Natural History, from Mr. H. Littledale.

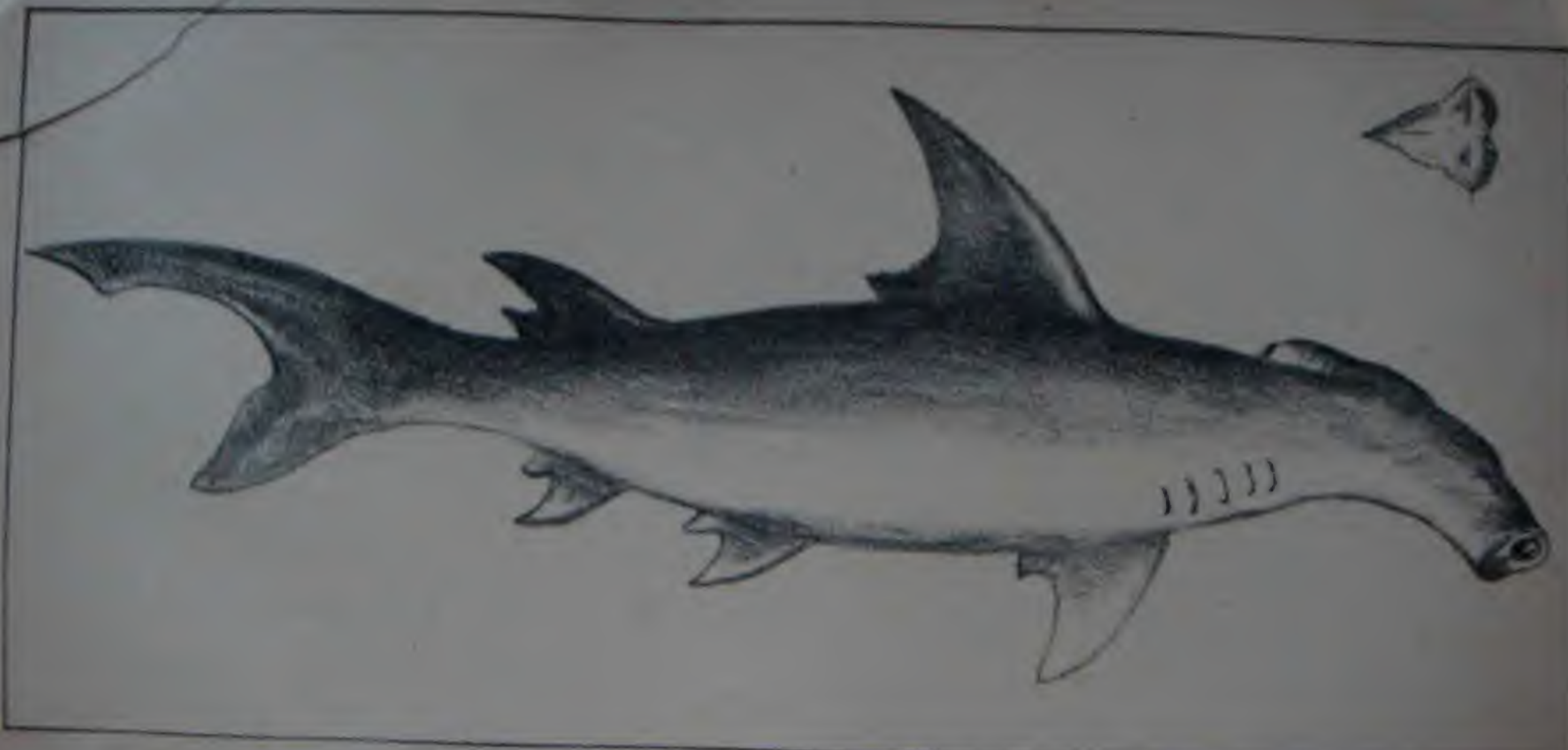
A collection of 40 specimens of snakes lent by Mr. G. W. Vidal, C.S., were exhibited, also a rug made by Mr. E. L. Barton out of 15 Afghan fox skins.

The Secretary announced that through the generosity of a dozen members the Society had been able to purchase for Rs. 150 the splendid pair of Ovis Polii horns which had been exhibited in their rooms.

Mr. J. H. Steel, A.V.D., Principal of the Government Veterinary College at Parel, read a paper on "The Horse, a Zoological Study," which will appear in the next number of the Journal.

Mr. Sterndale exhibited, through the courtesy of its owner, the Agent of the Waterbury Watch Company, the now-celebrated white monkey, which so nearly came to a tragical end in the great fire at Madras. He stated that it was a female albino of the common bonnet monkey, *Macacus radiatus*.

A further description of this monkey, with a plate, will be given in the next number.

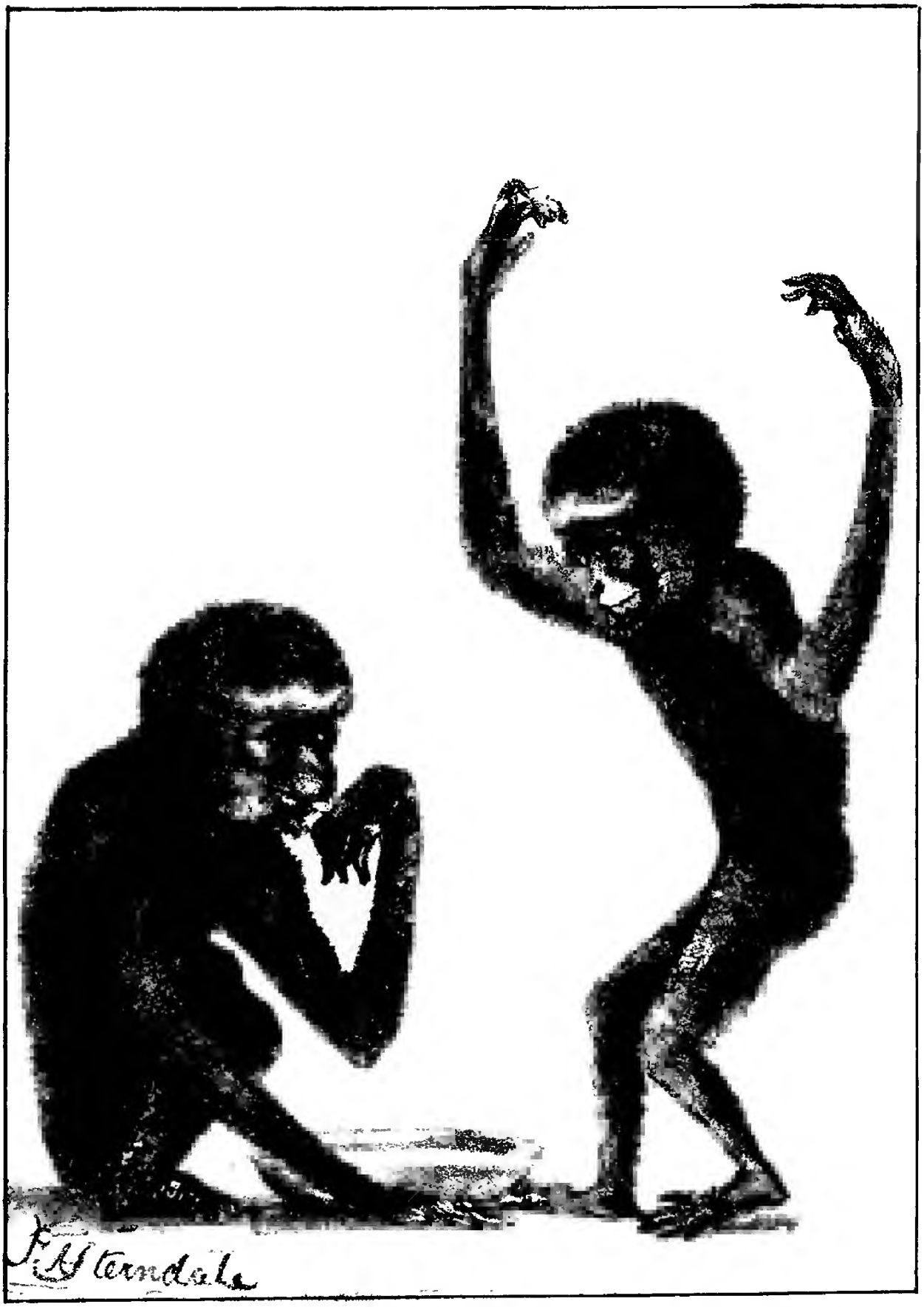


ZYGÆNA DISSIMILIS (*Murray*) SP. NOV.

Scale [illegible] inch to one foot

[illegible] (lower Jaw) Natural size

CURCUMA CAULINA.



Young Gibbons (Hylob[illegible] drinking and walking. They walk erect, and drink by dipping the h[illegible] liquid and then sucking off the moisture.

R. A. S.